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AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1836.

Practical and Theoretical Mechanics.

Report of Experiments made by the Committee of the Franklin Institute of Pennsylvania, on the Explosions of Steam-Boilers, at the request of the Treasury Department of the United States.

(*Continued from page* 92.)

The temperature of maximum vaporization was obviously about 292° Fah. The effect of the polish was thus distinctly shown by a comparison with the preceding table, which gave 327½° to 329½° for the same point. Perfect repulsion took place as low as 315° Fah. In repeating this series, with the surface tarnished by the effect of the heat and water used, the temperature of maximum vaporization was raised to 325½°, and of perfect repulsion to about 378°, confirming the conclusions from the preceding series.

3. The same copper bowl in a bath of oil, the surface being clean but not smooth; and again, the surface being very much oxidated, but free from grease, gave the results recorded in the next table. The nature of the bath would not, probably, materially affect the results with so small a quantity of water; the cooling effects, of the vaporization of the drop, upon the surface of the metal being inconsiderable. In these rough surfaces the effect of giving a tendency to motion to the drop of water, by allowing it to fall on the sides of the bowl, becomes very appreciable. This tendency assists the force of repulsion, and frequently determines a considerable increase in the time of vaporization.

The first series in the annexed table, consists of results obtained when the dish was clean but the surface not smooth; the second and third, when the dish was free from grease, but much oxidated.

Fah.°	Surface clean. Descending Series. Side drops. Time in sec's.	Remarks.	Surface clean. Descending Series. Centre drops. Time in sec's.	Remarks.	Surface oxidized. Descending Series. Side drops. Time in sec's.	Remarks.	Surface oxidized. Descending Series. Centre drops. Time in sec's.	Remarks.	Surface oxidized. Ascending Series. Side drops. Time in sec's.	Remarks.	Surface oxidized. Ascending Series. Centre drops. Time in sec's.
288.5	1	- -	1½								
290.6	-	- -	> 1								
292.6	-	- -	1	Nearly.							
294.7	-	- -	¾								
296.7	-	- -	-	- -	-	- -	-	- -	-	- -	3
298.8	-	- -	½	- -	-	- -	> ½				
300.9	-	- -	< 1	Very small drops							
302.9				are *still repelled*.							
305.0	-	- -	-	- -	-	- -	½	About.			
307.1	-	- -	1	Small drops rep'd.	-	- -	-	- -	-	- -	2½
309.2	-	- -	-	- -	-	- -	> ½				
311.2	-	- -	1½	- -	-	- -	-	- -	-	- -	2
313.2	-	- -	2	- -	-	Still repelled.					
315.3	-	- -	-	- -	-	- -	½ & ¼	- -	-	- -	1½
317.3	-	- -	-	Diff't parts of the	-	- -	¼	- -	-	- -	1
319.3				dish repel uneq.							
321.4	-	- -	-	- -	-	- -	½ & ¼				
323.4	-	- -	-	- -	-	- -		- -	-	- -	< 1
325.4	32	- -	-	Not perfectly rep.			-				
327.5	-	- -	-	- -	-	Repelled.	< ½				
329.5	-	- -	-	- -	-	- -	-	Not repelled.	-	- -	¾ - ½
331.5	-	- -	-	- -	5	- -	-	- -	-	- -	> < ½
333.6	-	- -	-	- -	-	- -	3½	- -	-	Not repelled.	
335.6											
337.6	-	- -	-	- -	-	- -	4½ & 2½	Perfectly repelled	¼ & ½	- -	¼ & ¼
339.7											
341.7	-	- -	-	- -	4	- -	3	Not perfect.	> ½	- -	¼ & ½
343.8											
345.9											
348.0	-	- -	-	- -	-	- -	-	- -	-	Just repelled.	¼
350.0											
362.3	-	- -	-	- -	-	- -	-	- -	1		
366.4	-	- -	-	- -	-	- -	-	- -	1½	- -	< ½

The point of maximum vaporization which, with the clean surface, was between 294° and 299°, was raised by oxidation to 317½°, and by an increase in the roughness of the surface to about 348°.

Comparison of Results for Copper.

4. A comparison of the results thus obtained for the vaporization from the surface of copper .07 inch thick, under different circumstances, are contained in the following table; which indicates also, pretty nearly, the relative times of vaporization of the same very small quantity of water under these circumstances.

The temperature of the liquid drops, and the pressure under which they were vaporized, are elements which, of course, it is unnecessary to consider, although it was deemed safer to enter them upon the original notes than to omit to notice them.

Nature of Surface.	Temperature of maximum vaporization.	Time of Vaporizat'n.	Temp. of Repuls.
	Fah.°	Seconds.	Fah.°
Surface highly polished,	292	3	315
„ tarnished,	325½	<1	
„ polished,	328½	2 & 1½	350
„ rough but clean,	296½	¾	
„ oxidized,	317½	¼	338
„ very much oxidized and not clean,	348	¼	

The results thus compared, are probably as accordant as ought to be expected, and indicate the effect of smoothness of surface to be to lower the temperature of maximum vaporization, but to increase the time required to vaporize at that temperature. Thus in the two extremes of high polish and considerable oxidation, the temperatures of maximum vaporization are 292° and 348°; and the times of vaporization 3 seconds and ¼ of a second. The nearness of the point of repulsion to the temperature of maximum vaporization is shown in those cases where the point at which perfect repulsion took place, was noted, nearly; the temperature exceeds that of maximum vaporization by about twenty-one degrees.

Vaporization of Drops of Water by Iron.

5. Experiments were also made to determine the temperature of maximum vaporization of water by iron with different states of surface, and as they preceded those made with the copper, the number of series was more considerable, that care might in a measure supply the place of experience. It will be wholly unnecessary to give the details of each series, since the mode of experimenting has already been stated, and the results can alone be of interest. At the same time, the temperature at which perfect repulsion of the drops took place, was observed. A portion of the experiments were made in an oil bath, others by communicating the heat through tin.

In the following table are the results for a bowl of wrought iron, (No. III,) three-sixteenths of an inch thick; the surface was cleaned with acid and alkali, after each series: it was not very different in smoothness in the different series, until the closing one, which is marked in the table. The oil bath was used in these experiments. The drops of water were let fall from a dropping tube, and one hundred and twenty-eight were required to make one-eighth of a fluid ounce; each drop, therefore, weighed about .45 of a grain.

Temperature of maximum vaporization, and of perfect repulsion, of drops of water let fall upon the sides of an iron bowl, three-sixteenths of an inch thick.

No. of Series.	Surface clean.			
	Temp. of max. vap.		Repulsion.	Remarks.
	Extremes.	Mean.		
First series, ascending			382½	Maximum vaporization passed, at 336½°. Repulsion not perfect at 378½°.
Second series, descending	331½ a 334½	333	373½	Repulsion not perfect at 370½°.
Third series, ascending			386½	„ „ at 385°.
Fourth series, descending	337½ a 341	339	382	„ „ at 378½°.
Fifth series, ascending	327½ a 331½	329½	390	„ „ at 389°.
Mean		333.8	382.9	
	Surface oxidated from use in the foregoing.			
Sixth series, ascending	343 a 350	346½	385	Drop breaks on irregular parts of bowl even at this point, i. e. repulsion not perfect.

The column of remarks in the foregoing table, is intended to contain principally the temperatures at which the repulsion was observed not to be perfect, and gives an idea of the approximation to the true point of repulsion which each individual observation affords. These numbers obviously differ from those for the temperatures of perfect repulsion, less than these latter among themselves, and much less than might have been expected, from the uncertain nature of the effect of slight inequalities of surface.

6. The following table contains another series of results with a thicker iron; they show that the cooling effect in the series just given, was imperceptible, no change in the position of the point of maximum vaporization having been produced by the increase of thickness, that is, by substituting a metal as the source of the communicated heat for an equal thickness of oil. This bowl was very highly heated after the first experiment, so as to cover its surface with a scale of oxide, and the results accord entirely with the similar ones already given, the temperature of maximum vaporization being raised.

Vaporization of water by an Iron bowl one-fourth of an inch thick. Surface cleaned with acid and with alkali.			
Temp. of max. vaporizat'n.		Temp. of repulsion.	
Side drops.	Centre.	Side.	Centre.
337½	358	405	
Scale of oxide by high heat.			
381½		433	456½

In the only other series of experiments with which the committee are acquainted, and which have been directed to the same point, those of Professor Johnson, the point of maximum vaporization is placed at between 304° and 320° Fah. The different nature of the surfaces employed may perhaps account for the difference of this result from that of the committee.

7. The repulsion as developed in solid tin, when heated, was made out from the experiments given below. The figure of the surface of tin was that of the under side of bowl No. VIII. viz. a portion of a spheroid nearly coinciding with a sphere of 3.35 inches radius; the surface itself was tolerably smooth, conforming to the exterior of the iron bowl; there were, however, small irregularities in it.

Table showing the Temperature of Maximum Vaporization for Tin. Surface slightly corrugated.

Centre drops.		Remarks.
Temperature.	Time in Secs.	
276½	1½	Side drops not repelled.
302		
a	¾	
321½		
338		
a	½	
364½		
379	< ½	
393	.6	Ten drops in six seconds.
409½	.5	Side drops repelled.
419½	.45	Maximum vaporization.
426	.5	
430	.56	
444	.6	
454	1.5	Tin not melted at surface, though the thermometer is 14° above its melting point below. Thermometer has been compared by the test of melting tin.

The experiments which follow the remark, "ten drops in six seconds," were all made by dropping several drops, not enough however to cool the surface down; measuring the time for the whole number, and dividing by that number. The point of maximum vaporization is placed, with probability, at 419°, the times had certainly increased in rising to 444, but in descending, the same certainty is to be found only on reaching 321½°. This slightly rough but polished surface, as it may be considered, had its temperature of maximum vaporization very certainly above that of the polished copper and of the smooth iron. The time of vaporization of a drop at this temperature was less than one-sixth of the corresponding time for the polished copper, and less than that for the clean copper surface; agreeing more nearly with that for the smooth iron, which was much its inferior in lustre. A correct induction could only be had by varying the number of metals, and by frequent repetition of the results, but so far as these experiments go, they indicate that this repulsion does not depend alone upon the relative polish of the different metallic surfaces.

8. The conclusions which they fairly warrant, are as follows:

1st. With the same metal, the temperature of maximum vaporization of water is lower, as the smoothness of the surface is greater, and the amount of vaporization in a given time at this temperature, is much diminished. In copper, the effect of polish and of oxidation, the two extremes, is shown by a difference in the temperature of maximum vaporization, of 56 degrees, that point being in the two cases, 292 and 348°. Further, the ratio in the times of vaporization at these two points, is as twelve to one, or for the same drop of water, 3 seconds and ¼ of a second. In iron, the smooth surface gave, for the temperature of maximum vaporization, 334, or 337½°, the oxidated 346½°, differing but little from the former; but when highly oxidated, gave 381, or a difference of about 45°, the time of vaporization not differing greatly in the two cases.

2d. The temperatures of maximum vaporization for copper and iron, in similar states of surface, differ between thirty and forty degrees, the iron having the higher point. The time of vaporization at the maximum, is less in the copper than in the iron, in the ratio, probably, of two to one, or nearly in the ratio of their conducting powers for heat, which are as two and a half to one.

3d. The temperature of maximum vaporization, for oxidated iron, or for highly oxidated copper, corresponds nearly to that at which steam has an elastic force of nine atmospheres. But the vapour was formed under atmospheric pressure only.

4th. A repulsion between the metal and water is perfect at from twenty to forty degrees above the point of maximum vaporization, following more closely upon the temperature of maximum vaporization in copper than in iron. At these temperatures, the water does not wet the metal. The drops of water are put in rotary motion in variable directions, and sometimes remain at rest, slowly vaporizing. When very small, they sometimes leap vertically from the surface of the metal. They seem to vaporize from the side next to the metal.

A general view of the facts just deduced, is given numerically, in the following table.

Table showing the Temperature of Maximum Vaporization of Drops of Water in Copper and Iron Bowls.

Nature of the Surface.	COPPER .07 inch in thickness.			IRON 3-16ths inch thick.		¼ inch thick.	
	Temp. of max. vap.	Time in seconds.	Temp. of repuls'n.	Temp. of max. vap.	Temp. of repuls'n.	Temp. of max. vap.	Temp. of repuls'n.
Highly polished	292°	3	315				
Clean, not polished	296½	¾		334*	383	337½	405
Oxidated	321	½		346½†	385		
Highly oxidated, and not clean	348	¼	338				
Ditto, but clean						381	433

* Mean of three series. Time between 1 sec. and 1½ seconds.
† Time about 1 second for .45 gr. of water.

There can be no doubt that, at the temperatures determined as those of maximum vaporization, an effective force of repulsion between the heated metal and the water has begun to be developed. For we may assume that heat will tend to pass from the metal to the water the more rapidly as the temperature of the former exceeds that of the latter, which would tend to increase the vaporization after the repulsive action had commenced.

The temperatures of maximum vaporization are reached in practice in the high pressure steam engines. The locomotives with flues of copper, use steam of sixty pounds pressure upon the safety valve, corresponding to nearly 306° Fah.; a temperature which is but fifteen degrees below that found for the maximum vaporization by oxidated copper. The iron boilers of our high pressure engines use steam of from ten to eleven atmospheres, or from 354° to 360° Fah., the higher temperature being about twenty degrees below the temperature found for the maximum vaporization of water by an oxidated surface of thick iron.

It is possible, and indeed probable, that pressure may modify these results, all of which were obtained under atmospheric pressure. Pressure, tending to counteract the effect of the repulsion between the heated metal and water, would probably raise the temperature of most rapid vaporization.

Vaporization of considerable quantities of Water.

9. The results already presented, however interesting they may be in a practical or in a philosophical point of view, cannot be said to touch the question of the effect of the contact of water suddenly made with hot metal, in producing explosions. It is necessary to suppose so large a quantity of water, brought under the vaporizing influence of the metal as, except where there is a violent repulsion by the heated metal, to reduce materially the temperature of the surface. To study the question in this point of view, we must ascertain, if possible, the law, according to which a variable quantity of water, thrown upon heated metal, is capable of reducing its temperature, so as to produce the maximum amount of vaporization. That such a maximum may be

found, will be seen by considering the foregoing results. They show that an effective repulsion is developed between water and heated metal, increasing rapidly after a certain temperature, at which the vaporization is a maximum. Now water thrown upon a surface at its temperature of maximum vaporization, would cool it down rapidly below this temperature. Again, if thrown upon it at a temperature when the repulsive effect was very strong, it would not be able to cool it down as low as the temperature of maximum vaporization. Somewhere, then, between the points thus referred to, there will be an initial temperature, at which the vaporization will be the greatest possible, or a given quantity of water will be vaporized in the least time. It is obviously not as easy to solve this problem as the preceding one, nor can so satisfactory results be expected, nor results so constantly reproducible; its practical importance required that its solution should be attempted; and the method adopted was as follows. The same baths, viz. oil and tin, were used as in the foregoing series, to ascertain, generally, the effect of communicating heat through different media. Different metals, copper and iron, with different thicknesses of each, and different states of surface, were subjected to trial. The quantity of water was gradually increased, from small quantities, scarcely capable of reducing the temperature of the surface when the repulsive tendency was fully developed, to quantities as considerable as the bowls could contain. The study of each case was of course attended with much labour. In the greater quantities of water the temperature of the metal of the dishes was so much reduced as to affect that of the bath itself. Accordingly a mean of the temperatures, observed at regular intervals, is taken as the temperature of the bath on which the water was thrown, and which, taking the entire mass into consideration, was supplying an amount of heat due to that temperature, to the parts adjacent to the bowls. The oil bath was stirred to produce as nearly as practicable, a uniformity in temperature in the different parts.

Without knowing the temperature to which the parts of the heated metal, or of its bath, are reduced by the affusion of water, this kind of experiment supplies precisely the answer to the question in practice; ***at what temperature of a metal will water, thrown upon it in a limited quantity, be most rapidly turned into steam?*** Making due allowance for the different modes of communicating heat in the experiments and in practice.

Copper Bowl, No. VII.

10. The same bowl used in a former series of experiments was again applied, the surface being smooth. This bowl was a portion of a spheriod, approaching nearly, in its inner surface, to a spherical surface of 3.09 inches radius: the versed sine of the segment, or depth of the bowl, was 1.6 inches and its chord, or the breadth of the bowl 5.39 inches. The thickness of the metal was .07 of an inch.

The quantity of water first introduced was $\frac{1}{6}$th of an ounce by weight (60 grains troy,) the water being weighed in a small metallic dish, and thrown into the bowl, placed in the bath. One experimenter observed the temperature of the bath, and gave notice to another of the instant of introducing the water; the other made a memorandum of the temperature and time. The first observer gave notice of the instant at which the liquid began to boil, which was also entered upon the notes. The second then announced each minute, or half minute, as it passed, and the first gave the temperature of the bath at that time, stating also the circumstances taking place in the bowl, when remarkable. The same observer also gave warning when the liquid was about to disappear,

and a signal at the instant of its disappearance, which was marked by the second. The time between the introduction of the liquid into the bowl and its beginning to boil is deducted in each case in the following tables, so that they show the times necessary to vaporize the water, after it had been raised to the boiling point. At the high temperatures, the time required to raise the smaller quantities of water to ebullition, scarcely amounted to half a second. The times were noted, usually, by a pendulum beating seconds, sometimes by a quarter-second pendulum.

When a decided repulsion has commenced with these considerable quantities of water, the phenomena are of a very singular kind. The water assumes a rotary motion about an axis perpendicular, or nearly so, to the lowest point of the dish, and at the same time its figure changes, and from being circular in its horizontal section, becomes of an irregular oval, which contracts and dilates alternately as the mass revolves; the transverse axis contracting until its place is occupied by the conjugate, and vice versa. The direction of this rotation is not at all uniform, and the mass sometimes becomes quiescent, and then assumes motion in an opposite direction. When this state of things first begins, vapour sometimes bubbles or bursts up, through the liquid; but when fully established it is most copiously given off from below. In fact, the appearance is that of a stratum of vapour, between the water and the bowl, which becomes, at times, visible, when condensed at the edges.

If the results of the vaporization of one-eighth of an ounce of water, in bowl No. VII. be taken, and a curve be traced from them, of which the ordinates represent the differences between the times of evaporation and a constant quantity, and the abscissæ the differences between the temperatures and a constant quantity, a remarkable regularity will be found in the results, and an approach to a minimum in the time of vaporization. This affords good grounds for attempting to calculate the temperature at which the maximum vaporization, with this quantity of water, would have taken place; or the temperature above which the water introduced would not be able to cool the bowl as low as the temperature of maximum vaporization for drops of water. The obvious approximation of the curve just referred to, see Plate 5, Fig. 1, to the ellipse, induced the trial of the equation of that curve to represent the observations. The following table shows the results of the comparison of calculation and observation, the transverse of the ellipse being assumed equal to 262°, and the conjugate to 200 seconds, and the co-ordinates of the centre being 576° and 211.5 seconds.*

* That is, in the equation $A^2y^2 + B^2x^2 = A^2, B^2$; $A = 262°$ and $B = 200$ seconds. $X = 576°$, and $Y = 211.5$ seconds, are the co-ordinates of the centre. So that $x = 576°$ — the observed temperature, and $y = 211.5$ seconds — the observed time of vaporization.

No. of Experiment.	Observed Temperature of Vap'n.	Observed Time of Vap'n.	Ordinates from Observation.	Calculated Ordinates.	Difference.
	Fah.°	Seconds.	Seconds.	Seconds.	Seconds.
1	349.5	116.5	95.	100.1	+5.1
2	384.	71.	140.5	135.4	−5.1
3	420.5	46.	165.5	160.3	+5.2
4	452.	32.5	179.	175.4	−3.6
5	486.	22.	189.5	187.	−2.5
6	508.	18.	193.5	192.3	−1.2
7	526.	15.5	196.	195.4	−0.6
8	537.5	15.3	196.2	196.8	+0.6
9	558.	14.7	196.8	198.6	+1.8
10	568.	13.	198.5	198.9	+0.4

A similar comparison which addresses itself, even more directly to the eye, is given in Fig. 1, Plate 5, in which the upper dotted line is that traced from the observations, and the full line is the ellipse which has been assumed.

The general coincidence of these lines, varying only when the observations are indicated, by the nature of the dotted line, to have been irregular, or the near coincidence of the calculated and observed numbers in the table, and the variable sign of the differences, justify us in assuming the true maximum of vaporization at the temperature corresponding to the highest point of the ellipse; namely, to 576° Fah.

At about 576° Fah. then, a bowl of copper .07 of an inch thick supplied with heat by a medium like oil, would be able so far to resist the cooling action of 60 grs. of water, as to produce the most rapid vaporization; the quantity being sufficient to cover about one-tenth of the surface exposed to heat.

Copper Bowl, No. IV.

11. This bowl was thinner than the last, its thickness being .05 of an inch. Its figure within, approached nearly to a sphere of 3.1 inches radius, the chord of the segment being 5.25 inches, and the versed sine 1.45 inch; it deviated as little, therefore, from the figure of the last as could have been expected from the mode of forming it.

Nine observations were made of the vaporization of $\frac{1}{8}$th of an ounce of water in this bowl, placed in a bath of oil. Of these, seven are shown in the middle dotted line of Fig. 1, Plate 5, and agree very well with the ellipse traced in the full line; the two omitted were at temperatures lower than that of the lowest of the seven included in the figure. The following table shows the comparison of calculation and observation, assuming the major and minor axes of the ellipse to be respectively 251° and 214 seconds; and the co-ordinates of the centre 576° and 254 seconds. These values were not obtained rigidly, but they agreed better than numbers, greater and less, which were also tried.

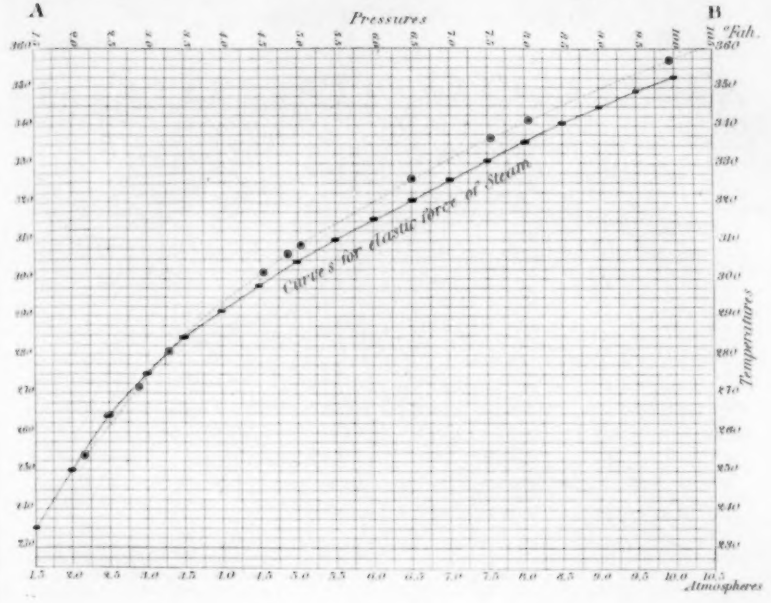
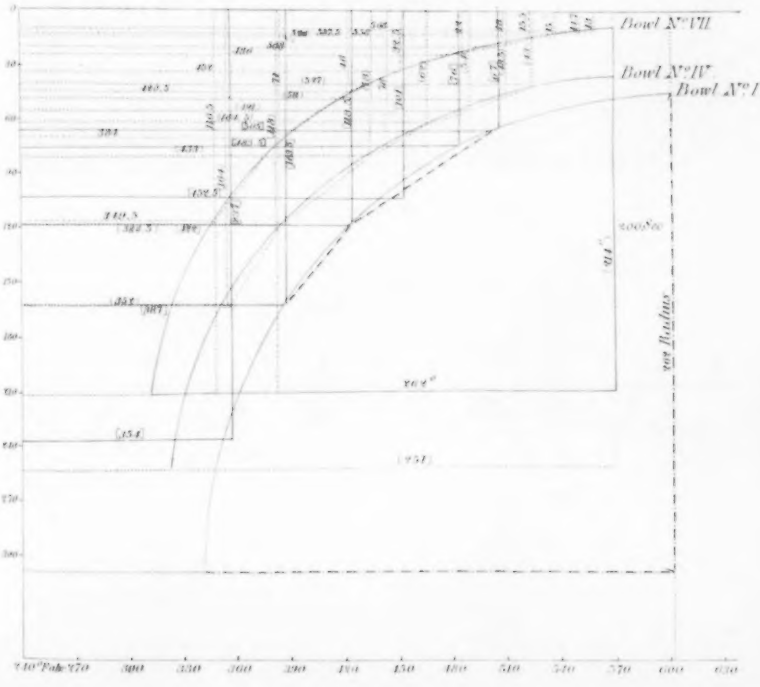

A
Pressures
B
°Fah.
Curve of for elastic force of steam
Temperatures
Atmospheres

Fig. 1


Bowl N°VII
Bowl N°IV
Bowl N°I.
Boiler
Pulleys
°Fah.

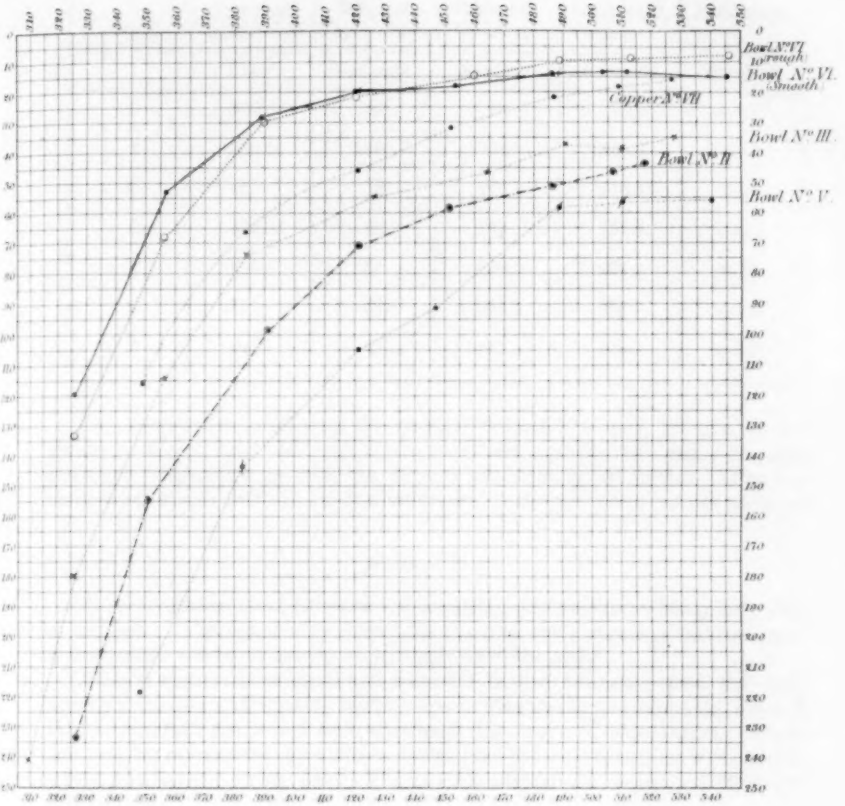
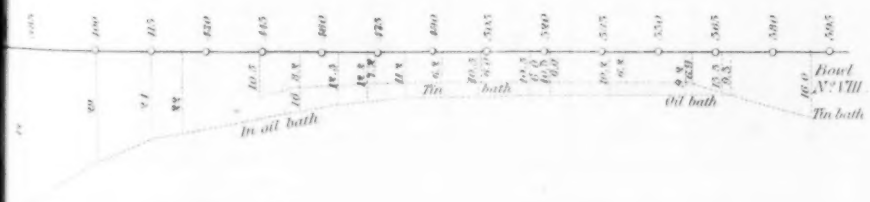

Bowl N°VII
rough
Bowl N°VI.
Smooth
Copper N°VII
Bowl N°III.
Bowl N°II
Bowl N°V.

Fig 2


In oil bath
Tin bath
Oil bath
Tin bath
Bowl N°VIII

No. of Observation.	Temp. of Vaporization.	Time of Vaporization.	Observed Ordinates.	Calculated Ordinates.	Difference.
	Fah.°	Seconds.	Seconds.	Seconds.	Seconds.
3	352	164	90	96.6	+6.6
4	382.5	118	136	136.3	+0.3
5	433	78	176	176.0	+0 0
6	464.5	62	192	191.8	—0.2
7	491	54	200	201.1	+1.1
8	511	48.5	205.5	206.7	+1.2
9	527	43	211	210	—1.0

The temperature producing the greatest vaporization with 60 grs. of water in a copper bowl .05 inch thick, would be nearly 576° Fah., or about the same temperature as with the greater thickness of .07 inches. The surfaces were nearly alike in the two cases, and both were clean but not polished.

Bowl, No. I.

12. Was thinner than either of the foregoing; its thickness being only .025 of an inch. The figure was nearly the same as the foregoing, and the quantity of water used and nature of the bath were the same.

Of eight observations made and recorded in the following table, five only appear to belong to the same curve; this is seen in the lowest curve, Plate 5, Fig. 1, in which the dotted line represents the curve of observation. These five may be represented by a circle determined from observations 3, 4, and 8, which give for the radius 262. The co-ordinates of the centre are 604° and 309 seconds.

No. of Observation.	Temp. of Vaporization.	Time of Vaporization.	No. of Observation.	Temp. of Vaporization.	Time of Vaporization.
	Fah.°	Seconds.		Fah.°	Seconds.
1	306.5	397	5	422	118.5
2	319	369	6	452.5	101
3	354	237	7	483.5	76
4	387	163.5	8	505	67

The calculations place the maximum of vaporization about 604° Fah., or 28° higher than the temperature shown by the other bowls, an effect due, of course, to the thinness of the metal of this bowl.

Vaporization in Iron Bowls.

13. Similar experiments were made with iron bowls of different thicknesses; No. V. .04 inch, No. II. .08 inch, No. VI. .18 inch, and No. III. of an intermediate thickness between Nos. II. and VI. The curvatures and general dimensions were intended to be those of the copper bowls, from which they in reality differed in no important particular. The radius of No. V. was 3.25 inches, of No. II. 3.1 inches, of No. VI. 2.9 inches; the chord of No. V. 5.2 inches, of No. II. 5.2 inches, of No. VI. 5.2 inches, the versed sine of No. V. 1.3 inches, of No. II. 1.45 inches, of No. VI. 1.6 inches. The difficulty of producing a uniform surface, and of retaining one of any smoothness, for a considerable time made these experiments much less satisfactory than those on the copper; in those with No. V. and No. II. oil obtained access to the cup and vitiated part of the results, and this was also the case at high temperatures with No. I. Small particles of water being thrown out of the dish, sunk below the oil without evaporating, and then in passing into vapour below the surface, threw up the oil with slight explosions. The surfaces were rough but clean, the quantity of water used $\frac{1}{8}$ oz. troy. The curves representing these observations are shown in Plate 6; and through the striking irregularities in the three lower ones, we see the effect of thickness of metal in increasing the amount of vaporization at a given temperature, the curve of No. III. being higher than that of No. II. and of No. II. higher than that of No. V. and we also see a tendency towards a maximum lying above 540° Fah., though, from No. III. and No. V. obviously not far above it. The difficulty of passing the maximum with these thin bowls consisted chiefly in the acrid nature of the vapour given out by the oil, which acting powerfully on the eyes, rendered accuracy extremely difficult, and the effort sustained very painful.

With bowl No. VI. greater pains were taken to smooth the surface, and this was cleaned with alkali, to free it from grease, and then with very dilute acid, which was washed off. The curve given to represent the observations, is altogether more regular than in the other cases, and the maximum was reached between 503° and 512° Fah., much lower than the corresponding point for the thin iron bowls.

If the vaporization by the copper bowl, No. VII. .07 inches thick, be compared with that of No. II. of iron .08 inch thick, it will be found to be much more considerable. In fact the curve traced for the copper bowl is exterior to the curve for No. III. and at the temperature of about 540° Fah. intersects that for the iron bowl No. VI. .18 inch thick. From 350° up to 508°, the time of vaporization in the copper bowl varies from $\frac{3}{4}$ths of that in the iron bowl of the same thickness, to $\frac{2}{3}$ths of the time, at corresponding temperatures. The specific heat of the iron, being slightly higher than that of the copper, bulk for bulk, would tend to keep up the temperature of the former metal, but the conducting power of the copper being more than double that of the iron, would much more than compensate for its lower specific heat.

14. The effect of a surface covered with a thick coating or scale of oxide, may be seen by comparing the dotted line near the full line for bowl No. VI. with the full line. At temperatures below 390° Fah. the scale of oxide diminishes the vaporization considerably, probably by intercepting heat; but when repulsion begins to be developed, the scale acts to prevent it, and thus to raise the temperature of greatest vaporization, and to diminish the time required for vaporization at a given temperature. It will be recollected that this temperature, of 390°, differs but seven degrees from that found for the maximum vaporization of drops from an oxidated surface.

This circumstance will be recurred to again.

Quantities of fluid, varying from $\frac{1}{16}$th up to $\frac{1}{4}$th of an ounce troy, were now used with a view to ascertain the effect of varying the quantity upon the temperature of maximum vaporization. The surfaces were varied also. The results are given in the following table.

Times of vaporization, at different temperatures, of different quantities of water in bowl No. VI., three-sixteenths of an inch thick, in an oil bath.

Temperature. Fah.°	One-sixteenth ounce. Time in seconds.		One-eighth ounce. Time in seconds.		One-fourth ounce. Time in seconds.	
	Smooth.	Rough.	Smooth.	Rough.	Smooth.	Rough.
323						231
324	50					
325					234	
326		69	120	134		
353						134
354	23					
356			53	68	127	
357		28½				
386	11					
387						
388		10½	29			75
389				29		
390					78	
419	9					
420			20	22		
423		7½				
425						46
427					46	
450					38	38
452	8					
453		7				
454			18			
455						
460				15		
461						33
485	8					22
486		7	14			
489				10		
492					26	
502					24	
503			13			
504	7 M*			M		
508		4 M				
511			13			
512				9		13 M
516					20	
517	8					
527						15
529					20	
534		5				
538	9					
544					19 M?	
546			15	8 M?		
548						15

* The letter M designates the temperature of maximum vaporization.

An examination of this table shows no *proper maxima* of vaporization; the differences in the times between experiments near the points of most rapid vaporization being too considerable to indicate a true maximum in any case. Comparing, however, the temperatures of most rapid vaporization as given by the table, for different quantities of water, we observe that the temperature of the metal, when water was thrown upon it, corresponding to most rapid vaporization, which, with $\frac{1}{16}$th of an ounce of water, was about 504°, was, with $\frac{1}{8}$th of an ounce, about 507$\frac{1}{2}$°, and with $\frac{1}{4}$th about 517°, having been raised but thirteen degrees by quadrupling the quantity of water, while the extent of surface of the metal directly in contact with the water was doubled. At these points, in fact, the repulsion between the metal and water was considerable on first projecting both the sixteenth and eighth of an ounce of water into the bowl.

The effect of roughness of surface is to be seen in the three series; the effect at the lower temperatures seems to be generally to diminish the amount of vaporization; and when repulsion would have taken place had the surface remained smooth to accelerate vaporization at a given temperature, raising the point of greatest vaporization on the scale. If this speculation be admitted, the temperature at which the rough and smooth surfaces vaporize equally, is but little above that of the real maximum of vaporization of the metal when the cooling effect of the water is supposed to be entirely destroyed; that is, when the water is thrown upon it by small drops.

A comparison of the first and second series, would place this point at about 386° Fah., the third and fourth, at about 388$\frac{1}{2}$°. The fifth and sixth would leave a doubt of its position, placing it by the nearest of two results at about 424°; while, on the other hand, the near approach at a lower temperature would incline us to make the coincidence conform more nearly to the numbers given by the other series, by selecting two less accordant times, at about 388° Fah.

The experiments on drops of water placed the temperature of maximum vaporization in this same bowl at 334° Fah. when the surface was smooth, and at 346$\frac{1}{2}$ when rough, no doubt a nearer approximation to the real point of maximum vaporization than that just deduced by the medium of a considerable quantity of fluid.

15. No satisfactory method occurred of ascertaining the temperature of a small portion of a piece of metal of the thickness used in steam boilers and exposed to the action of water, at or below the boiling point, while it received heat from a constant source. It was deemed advisable, therefore, to compare the effects which would be produced by communicating heat through a very good conductor, such as tin in the solid or liquid state, and through an imperfect conductor and circulator, like the thickened oil employed in the foregoing series.

The same bowl was therefore tried in tin and in oil, with the same quantity of water, and with the following results, the bowl being .25 inch thick, (No. VIII.) and the material iron. The curves of observation are traced on Fig. 2, Plate 6.

Table of the times of Vaporization in different Baths.

Temperature.	One-eighth ounce. Time in seconds.		Remarks.
	Tin.	Oil.	
455	8¼	16	Bowl, No. VIII., ¼ inch thick.
465		12½	
473	7¼		
481		11¼	
491	6¾		
502		10½	
504	6		
513	6	10½	
521		10½	
537		10¼	
539	6¼		
555		9¼	
559	6⅞		
567	15½		
568		9½	
591	16		

The irregularity of the series made with the oil bath, throws a doubt upon the maximum obtained, particularly as, with a thinner vessel, the preceding series gives a lower temperature as that of most rapid vaporization, and the recurrence of the same time during a range of nineteen degrees, confirms this doubt.

The temperature of greatest vaporization in the tin was about 508½° and the time but six seconds, while with the oil it was nine and a quarter seconds, as shown in this series, and probably less than eight, as shown in a foregoing series. The temperature of maximum vaporization here given for the oil bath, is 555°, differing 46½° from that for the tin. Somewhere between 559° and 568° the times of vaporization are the same for each bath, the repulsion due to the greater heat communicated by the tin counterbalancing the diminished vaporization from the less heat given by the oil.

This comparison shows that the thickness of metal at which the effect of the material of the bath, or means of applying heat, would vanish, is by no means reached in practice.

16. With a less thickness of metal, this difference in the nature of the bath was of course more striking. In a dish, one-twelfth of an inch in thickness, the vaporization, in a bath of tin, compared with a series made with the same surface, in an oil bath, was as follows:

Iron Bowl No. II., 1-12th inch thick. 1-8th oz. water.			
Surface rough.			
In Tin.		In Oil.	
Temperature.	Time in Seconds.	Temperature.	Time in Seconds.
446°	7½	421°	71
460½	6	452	57
484	6¾	487	51
500	6½	507	47
554	8	517	44
566	8		

The average time of vaporization in the oil bath is rather more than eight times that in the tin.

These experiments, therefore, do not entirely represent the case in practice where heat is communicated by flame, by contact of heated air, and by direct radiation.

The maximum shown by this table lies certainly between 460½° and 500°; the apparent maximum being at 460½°, the maximum given, by omitting the observation at 484°, being about 468°; and that by omitting the observation at 460½°, being about 500°.

The minimum time for the oil bath is obviously not reached; it will be recollected that this is probably as high as 570°, or about fifty degrees higher than the last observation in the table.

The times of vaporization for the tin bath, are nearly the same as those for the bowl of $\frac{3}{16}$ths of an inch thick. In fact the heat may be considered as passing through a very thick tin bowl, to the iron, and kept up by flame beneath a second iron surface; the modifying effect of an additional thickness of the iron bowl is therefore small.

Vaporization of increased quantities of Water.

17. It was now an object to increase the quantity of water introduced into the thickest of the iron and copper bowls until the limit of their respective capacities was reached, so that each part of the bowl to which the heat was applied should have also the cooling effects of the water upon it; the effects of the contact of a large quantity of water with hot metal would be thus represented. The nature of the results could not be expected to be otherwise than general.

For reasons already stated, the tin bath was used to communicate heat, and the projection of small particles of water from the dish was avoided by a rim of tin, which gave free escape to the steam, while it remedied, in a considerable degree, the difficulty just referred to. The temperature of the whole bath was in no case reduced very materially, a constant source of heat being applied

below; but the metal which was near the bowl had its heat carried off faster than it could be supplied, and thus the temperature of the bath could show nothing more than the temperature of the bowl at the instant of projecting the water into it. The following remarks apply to the thickest iron bowl, or No. VIII., .25 of an inch thick.

One half a fluid ounce of water reduced the temperature of the bowl from 417° to a little below 212°, or through 205° Fah.

Three-quarters of an ounce, introduced at 504°, cooled the metal of the bowl below the point of repulsion for drops, or through about 120 degrees, the higher temperature of the metal more than compensating for the increased quantity of water evaporated. This bowl contained, up to the level of the bath, nearly three and a half fluid ounces. The surface was oxidated.

The following remarks apply to the temperatures of the metal when the water was first introduced.

The temperature of maximum vaporization for $\frac{1}{4}$th of a fluid ounce, was above 480° Fah., but probably not very far. Between 569° and 628°, the time of vaporization of the same quantity of water increased from 10 to 20 seconds, or was doubled. The time at the point of maximum vaporization was about 8 seconds. With one-half of an ounce of water the probable temperature of maximum vaporization was about 504°, and the time of vaporization $11\frac{1}{4}$ seconds.

The different experiments with one fluid ounce of water, by comparison with a series in another bowl, indicated the temperature of maximum vaporization to be as high as 555°. At 518° and at 616° the times of vaporization were nearly the same; namely, 16 seconds.

The temperature of maximum vaporization, for two ounces, was above 600°; at 580° and at 602°, the times of vaporization were the same; namely, 24 seconds.

This quantity was as great as the experiment could be made with, satisfactorily.

From the results we see that the times of vaporization of quantities of water in the ratio of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 and 2, or of 1, 2, 4, 8 and 16, at the temperatures corresponding to the least time of vaporization, were about as 6, 8, 11, 13, and 22, or as 1, $1\frac{1}{3}$, $1\frac{5}{6}$, $2\frac{1}{6}$, $3\frac{2}{3}$, not far from the ratio of the square roots of the quantities, which would have given 1, 1.4, 2, 2.8, 4.

The temperatures of the metal on which water being thrown will reduce it to such a degree, that the entire vaporization shall take place in the least time, increased for quantities varying from $\frac{1}{8}$th of an ounce up to 2 ounces, or sixteen times, from about 460° up to 600°. The ratio of the temperatures above 212° was as 1 to about $1\frac{3}{7}$, indicating the approach to a temperature of the metal at which any large quantity of water introduced into a thick iron vessel, would be vaporized most rapidly.

This point was elucidated directly by heating a cast iron bowl, half an inch thick, in a charcoal fire; this bowl was of the same figure, nearly, with those already described, it could contain about ten fluid ounces of water. When heated to redness, being still kept on the fire, one fluid ounce of water was introduced, and lasted about 115 seconds: 4 ounces lasted in one experiment, 294 seconds; and in another, 304 seconds; and the red heat was not kept up in the dish: the water was repelled at first.

18. In the copper bowl, No. VII., the thickness being .07 inch, or about .36 of that of the iron, the following results were obtained, the same tin bath being used, and the surface of the copper being smooth.

At a temperature of $465\frac{1}{4}$°, $\frac{1}{8}$th of a fluid ounce of water was repelled, the

repulsion being perfect nearly to the close of the experiment. This quantity required 175 seconds to evaporate. At the initial temperature of 501° the same quantity required 187 seconds to vaporize it. At the higher of these temperatures, in an iron bowl of nearly the same thickness, but in an oil bath, the maximum of vaporization was not reached.

One-fourth of an ounce required 13 seconds to vaporize it at 469° Fah., and 405 seconds at 529°, at which latter temperature the repulsion was perfect nearly throughout the experiment.

Three-eighths of an ounce vaporized in 12 seconds, at the initial temperature of 471°, and the metal in contact with the dish, was solid. At the initial temperature of 486° the same quantity required 30 seconds, and the repulsion was perfect for 15 seconds.

Five-eighths of an ounce vaporized in 15 seconds, at the initial temperature of 481°, and also at 509½°. The minimum time of vaporization being, probably, between these temperatures.

One ounce vaporized in 22 seconds, at 465½°, as the initial temperature; in 16 seconds, at 486°, and the tin was found congealed beneath the cup; in 17 seconds, at 511½; the minimum time being probably between 486 and 511½.

Two ounces vaporized in 24 seconds, at 511½°, as the initial temperature; in 21 seconds at 526°, and in 22 seconds at 556½°; the minimum time of vaporization being probably at or near 526° Fah.

From these results we see that between 471° and 486° Fah. ¼, ⅜, ⅝, and 1 oz. vaporized in times differing but little from each other, the range being from 12 to 16 seconds; and that with two ounces, from 511½° to 556½°, the time of vaporization was about four times the least of those just referred to. With quantities of water, varying from one-eighth of what the part of the bowl which was in contact with the bath, could contain, to one-half the capacity, the maximum vaporization was between 471° and 481°, and 481° and 511°, and the entire capacity of that part being filled, raised this temperature only to 526°.

This indicates the energy of the repulsion; for the evaporating surface being increased but about three times, and the water increased eight times, the initial temperature corresponding to the maximum of vaporization was raised but 56°. It shows, further, that with metal at this temperature, eight times the volume of steam was formed in three times the time, when the entire capacity was filled and compared with one-sixteenth of this capacity filled; the quantity of 6121 cubic inches of steam, or nearly 3½ cubic feet having been generated in 42 seconds, at the initial temperature of 526°, the steam having atmospheric pressure.

The copper, which was bright when the experiments were commenced, became oxidated as they progressed, thus tending to raise the temperature of maximum vaporization.

Conclusions.

19. From the foregoing details may be deduced the following general conclusions, which will be found of practical importance.

1st. The vaporizing power of copper, when supplied with heat, by a bad conductor or circulator, such as oil, increases with great regularity as the temperature increases, up to a certain point, the water being supposed thrown upon the copper surface, in small quantities. Copper flues, heated by air passing through them, would be in this condition if left bare of water, and then suddenly wet. This holds with copper $\frac{1}{16}$th of an inch thick, without indica-

tion that a limit will be attained by a much more considerable thickness. The temperature at which the metal will have the greatest vaporizing power, is about 570° Fah., or about 230° below redness, according to Daniell.

The law of vaporization of small quantities of water, by a given thickness of copper, is represented with singular closeness by an ellipse, of which the temperatures represent the abscissæ, and the times of vaporization the difference between a constant quantity and the ordinates.

2d. The same power in thin iron, .04 ($\frac{7}{32}$) inch thick, increased regularly, and was at a maximum, probably, at 510°. With thicker metal the power increases more rapidly at the lower temperatures, and varies very little, comparatively, above 380°, with thicknesses exceeding $\frac{1}{8}$th, and less than $\frac{1}{4}$th of an inch; attaining a maximum at about 507° Fah., when the quantities are small; rising to 550°, and much above, as the quantity of water is increased relatively to the surface of the metal which is exposed. Quadrupling the quantity of water, the entire amount being still small, nearly tripled the time of vaporization at the maximum.

3d. When copper of $\frac{1}{16}$th of an inch in thickness, was supplied with heat by melted tin, a worse conductor, and having a lower specific heat than copper itself, the time of vaporization, in a spherical bowl, of quantities varying from $\frac{1}{16}$th to $\frac{1}{2}$ of the entire capacity of the bowl, increased but three-fold, and the temperature of greatest evaporation was raised but 56°, or from 470° to 526°. When the bowl had half of the portion which was exposed to heat filled, the weight of the water was about one and one-tenth of that of the metal.

4th. The times of vaporization of different quantities of water, varying from $\frac{1}{8}$th of an ounce to 2 ounces, in an iron bowl $\frac{1}{4}$th of an inch thick, and supplied with heat by the tin bath, were sensibly, as the square roots of the quantities, at the temperatures of maximum vaporization for each quantity.

These temperatures were raised from about 460° to 600°, by increasing the weight of water about sixteen times, indicating that considerable quantities of water, thrown upon heated metal, will be most rapidly vaporized when the metal is at least 200° below a red heat.

5th. While a red heat, visible in daylight, given to a metal, even when very thick, and supplied by heat from a glowing charcoal fire, does not prevent water, when thrown in considerable quantities, from cooling it down so as to vaporize the water very rapidly, it is much above the temperature at which the water thrown upon the metal will be most rapidly evaporated. Thus one ounce of water was vaporized in 13 seconds, at about 550°, in a wrought iron bowl $\frac{1}{4}$ of an inch thick, and required 115 seconds to vaporize in a cast iron bowl $\frac{1}{2}$ an inch thick, at a red heat. Four ounces in the latter bowl vaporized in about 300 seconds, the bowl being red hot when it was introduced; and two ounces vaporized in 34 seconds at 600° Fah.

6th. The temperature of greatest vaporization, with a given thickness of metal, is lower in copper than in iron, the repulsive force being developed at a lower temperature. With equal thicknesses of iron and copper, the vaporizing power of the latter metal, at its maximum, was, with the oil bath, one-third greater than that of the former, and with the tin bath the power of copper .07 of an inch thick, was equal, nearly, to that of iron, $\frac{1}{4}$th of an inch thick, each being taken at its maximum of vaporization, for the different quantities of fluid employed. As the maxima for the iron are higher than those for the copper, the advantage will be still greater in favour of copper when the two metals are at equal temperatures.

7th. The general effect of roughness of surface is to raise the temperature at which the maximum vaporization occurs, and to diminish the time of vapo-

rization of a given quantity of water at an assumed temperature below the maximum.

8th. Though it has been shown that water thrown upon red hot metal is adequate to produce explosive steam, even when it does not cool the metal down to the temperature of most rapid vaporization, it is not the less true that metal more than two hundred degrees below a red heat, in the dark, is in the condition to produce even a more rapid vaporization of water thrown upon it, than when red hot.

Stationary Temperature of Alcohol on heated Metals.

20. A curious fact was observed in regard to the temperature to which alcohol of the specific gravity .81, containing, therefore, 93 parts of absolute alcohol and 7 of water, could be raised in a heated dish. It is necessary, as an introductory remark, to recall the fact that when the temperature of a liquid is gradually raised, by applying heat to the vessel containing it, a limit is reached when the temperature of the liquid becomes stationary, the vapour given out in boiling carrying off the heat which enters the mass. When alcohol, of the strength above stated, was projected into a bowl heated above the temperature at which repulsion of the fluid takes place, the temperature of the liquid did not rise to its boiling point. In fact, the stationary temperature, instead of corresponding with that of ebullition, was lower as the temperature of the dish was higher. This experiment was made in the course of attempting to infer the probable temperature at which water might be repelled from the more readily attained temperature of the repulsion of alcohol. Not being of direct application to the subject before us, it was not carried as far as in other hands it would deserve.

Temperature of Alcohol vaporizing in a Copper Dish, .07 inch thick.

Temperature of dish.	Temperature of Liquid.	Time of Vaporization in seconds.	REMARKS.
381°	169½		Quantity thrown in not measured, nearly fills the dish.
396	165½		
418½ *a* 409½	165	65	
430 *a* 425½	164	72	
438	164	75	
445 *a* 440	163	85	One ounce of liquid.
441	159¼		
448	158¼		
,,	158¾		
,,	159¼		
453	157¼		

(*To be continued.*)

Decision of the Circuit Court of the United States, for the Eastern District of New York, in a Patent case involving some important principles. To which is appended some remarks by the Editor.

UNITED STATES CIRCUIT COURT.

Before Judge Thompson.

Henry Stanley vs. Henry Hewitt.

This was an action founded upon a patent granted to the plaintiff, Henry Stanley, by the United States, the 17th December, 1832, upon a specification and application made to the patent office the 11th of October, 1832, for an improved rotary cooking stove. The plaintiff, by several witnesses, proved the originality of the invention in him, its importance and usefulness, and that the defendant had, from patterns taken from the plaintiff's stove, made and caused to be made and sold a large number of stoves, and was still pursuing the business.—The defendant to show that the plaintiff's patent was void; called Elisha Town and his son, and others to prove that in 1823 and 1824, he invented and procured to be cast a rotary stove, and that the plaintiff's stove revolved like it—also a Mr. Gould to prove that the plaintiff took the collars and flues in the cap of his stove from said Gould's stove, and also other witnesses to show that the plaintiff, as well as others, had used the collars and flues long before the plaintiff's improved cooking stove was invented; and also that the defendant attempted to show that the plaintiff had sold his stoves and given his invention to the public before he applied for his patent.

The plaintiff, in reply, called numerous witnesses to show that Town's stove, whatever it was, was useless, and had been abandoned as such; and that the plaintiff had no knowledge of it when he made his invention and improvement, and that his stove, in all the important improvements by him claimed, was wholly unlike Town's stove, and that collars and flues were not claimed by him as his invention, independently of his rotary plate in which they were attached, and that when they were put upon the Gould stove it was done at the plaintiff's suggestion. And that all the stoves delivered out before the application for the patent were delivered to be used on trial and with a view to test the utility of its improvements. The trial was a very laboured one, and occupied five or six days; but finally resulted in a question of law, growing out of the wording of the specification; which appeared to have been drawn up by the plaintiff without proper legal advice.

On the part of the plaintiff it was insisted that the claim, in his summary, was for a combination of certain improvements he had made in the cooking stove connected together and attached to the top or cap of his stove, put in motion; and that it was the combination which he claimed, and not the parts forming the combination separately, and that his specification would bear that construction.

On the part of the defendant, it was insisted that the plaintiff had so worded his specification that it would not bear that construction, and that it really claimed the different parts comprising the top or cap of the stove separately and independently of any combination, and that his specification was otherwise defective.

Judge Thompson, in the progress of the cause, gave his opinion that putting the stoves out on trial and for the purpose of experiment and improvement, was not such a public use of them as would be considered as a dedi-

cation to the public—that the plaintiff was justified and had a right to test the utility of his invention, and see what improvements might be made before he applied for his patent, and that this was an article which would be tested by being put into several families, where it might be differently used by different housekeepers.

In charging the jury, Judge Thompson, after stating the case and the difficulties arising from the obscurity of the language employed in the summary of the specification, remarked that in all cases, where consequences of great importance to the parties were involved, the jury must expect that the views of each, would be presented with great earnestness and zeal. Nor is it surprising (said he) that in such controversies, matters not materially connected with the merits of the issue, should be brought before the Court and Jury during the progress of the trial.

These remarks are applicable to the case now under consideration. It evidently involves matters of importance to the parties concerned, and has been accompanied by circumstances having no material bearing upon the questions in issue. *We*, however, are to examine the controversy, and determine it, by the law and the evidence, without reference to extrinsic matters, having no bearing upon its merits. And in this view of the subject, it is of no consequence whether the plaintiff, Mr. Stanley, has, or has not, accumulated a fortune, as the fruits of his invention. If, by his own talents, industry, and perseverance, he has produced a machine, useful in itself, and approved of by the public, he is entitled to the protection of the law, so far as he has rights to be preserved and guarded. And if, on the other hand, he has interposed claims which cannot be the subject of legal sanction, he must abide by the consequences of his fault, or misfortune.

I state to you, gentlemen, in the outset, that this is not a case free from difficulties. But I have the consolation of knowing that my decision of the matter *need* not be final, and that any mistakes committed *here*, may be reviewed and corrected by another tribunal, where I, too, shall have an opportunity of considering the subject with more care.

In my view of the case, much evidence has been introduced upon both sides, which is entirely irrelevant. The plaintiff's rights, whatever they are, depend upon his patent, and if he has any by his patent, and has not abandoned them to the public, he is entitled to protection. I confess to you, that my own prepossessions lean towards useful improvements, and I would construe the patent act with a liberal spirit, and expanded views. It is a beneficial law, having its foundations in public policy. Its object is, to encourage the enterprise of ingenious men, that the results of their labours, being brought into view, may be first enjoyed by the inventors for a limited period, and then dedicated to the public benefit forever afterwards. Nevertheless, I do not mean to say that all patents are to be protected *at all events*, but those only are to be sustained which have the sanction of law. It is a well known fact that patents are granted at the Patent Office, not after an examination into their merits, but upon *ex parte* statements, and hence their real claims may be afterwards investigated with proper strictness in a court of law.

There are some general rules always to be observed while considering this subject. In the first place, to entitle a patentee to maintain an action for a supposed violation of his rights, his invention must be both useful and new; not that its usefulness is to be scanned with a critical eye, to ascertain a given amount of benefit to be derived from it, but the invention must be useful, as contradistinguished from that which is frivolous, or wholly

worthless. If not frivolous, or entirely useless, the requirements of the law in this particular are complied with.

With regard to the invention before us, it is clearly useful; this is proved by the testimony of witnesses on all sides. It is proved, also, by the great extent of the plaintiff's sales, by the favour of the public, which has been liberally bestowed upon it, and by the palpable imitations of the plaintiff's models in the case under consideration.

If the plaintiff has legal rights here, there can be no doubt that they have been violated by the defendant. There is no substantial difference between the stove made by the defendant, and that invented by the plaintiff; the one is a copy of the other. And as to the extent of the violations, there is as little doubt. If you believe the testimony of Mr. Randal, the defendant sold a hundred stoves before the commencement of this suit, if his own declarations are to be credited, for he told the witness, in express terms, not only that a hundred stoves like these *had been sold* in Vermont, but that they had been sold *by him*. If this witness, therefore, is worthy of credit, (and he stands entirely unimpeached in every respect,) there can be no doubt that the plaintiff's rights have been violated by the defendant, if, in fact, it shall appear that he has any which the law can protect.

But the great question is, whether he has any such rights, and the solution of that question is to be found in the patent itself.

And here I may remark, that much has been proved and said in relation to the inventions of Town and Gould. The evidence upon these points is only important in one point of view, and in that it will be here considered. It shows that the materials, or component parts, of Stanley's stove are not in themselves *new;* and if the plaintiff claims a combination of things, he has evidently taken old materials to form his machine with, whatever it may be.

In relation to this part of the case, I would observe, that the particular words used in the specification and summary of this patent are of no importance. The office of words is to convey ideas, and our province is to determine what the party intended to express by the language employed. Did the patentee intend to claim the discovery of a *principle*, in the abstract or philosophical sense of that term? or did he intend to describe a contrivance, or machine, new and useful in reference to the purpose for which it was produced? He claims in his summary, "*the* revolving top plate," as a constituent part of his invention, and the first inquiry is, whether, before the use of Stanley's stove, a contrivance had been used by which the utensils to be heated had been brought over the fire, by means of a top revolving upon its centre. If the patentee claims this revolving *motion* as his own discovery, in its application to a cooking stove, he evidently includes in his patent that which is not his own discovery; for Town's stove had a revolving top, or drum, intended to accomplish the same object, by means somewhat similar.

It is very possible that Town could not maintain a patent for that invention, because he long ago gave it up, and abandoned it to the public. He did not, however, abandon it to the *plaintiff*, and all other persons might use it as well as he. If Town's discovery was abandoned, the only claim to it which Stanley can maintain, is the use of the thing as a part of his combination; and here we must determine what Town's invention was.

It is evident that he invented a revolving drum or top of a stove, to convey vessels to and from the fire by a rotary motion and concentrate the heat around them when placed there. This contrivance he gave up, or

abandoned, because it was useless, that is, useless in its then combination, though not in the abstract—for the principle or contrivance, as to the revolution, remains. As a cooking machine, the stove of Town was good for nothing; but its revolving motion might be made useful when brought in connexion with other constituents properly adapted to the objects in view.

The same remarks are applicable to the raised cones, or collars, and the flues. Each of these was old, and each had before been used either by itself or in other combinations. Stanley himself had used the collars in his own stove, as far back as the year 1828. So had Wilson—and this part of the machine is confessedly old. So with regard to the flues. If Stanley was the inventor of these, he had abandoned them to the public long before the date of his patent, and he cannot, therefore, now claim them as the subject of a patent. But the question is, whether Stanley *does* claim these materials or constituents as his invention?—for if he does his patent is void. He would then claim as his own the discoveries of others, or endeavour to maintain that which he had, by use, dedicated to the public.

If, on the other hand, the patentee claims a *combination* here, and nothing more, then I have no hesitation in saying that his rights are secured. If he goes for the elements or constituents of his machine, his patent is void, but if he merely claims a new combination of old materials, his rights may be protected. The patent itself is somewhat obscurely drawn, but the invention is useful and meritorious, and I am disposed to give it all the protection which the law will allow. A liberal construction should be given to these instruments, nor should a severe criticism be bestowed upon language used, for the most part, by the inventors themselves, who are, in many cases, altogether unskilled in the use of technical terms. We are always to ask ourselves on these occasions, what was the intention of the writers, and if that be discovered, the particular words used are altogether unimportant.

With these views, and under these considerations, I proceed now to give you my notions as to what this patent contains. It concludes with a summary in the following words:—"the *principle* for which I claim the invention, and for which I ask letters patent," is "the revolving top plate or fixture into or on which are placed the principal utensils used in cooking," &c.

By the patent law, the party is required to describe that which he makes, that the public may understand *the thing*, and be able to construct the like after the patent shall have expired; and hence there is a necessity for a proper observance of this requirement of the act. In this case, the plaintiff claims the specific thing set forth in the summary, and we must turn to the specification in order to understand what that thing is. The term used in the summary is "principle," but a reasonable interpretation must be given to it, or no sensible exposition of the parties' meaning can be obtained. He evidently did not intend to claim the discovery of an abstract thing, or entity, but some tangible mechanical contrivance, described in the specification. By "*principle*," he evidently intended a contrivance or thing described; and as there is no magic in words, we may fairly give this interpretation to the term used.

The plaintiff then patents *this* "revolving top plate," with its collars and flues, but instead of describing his invention as it really is, a *combination*, he describes the constituent parts. His improvement consists of a combination, and he should so have described it, and I have no doubt that a specification may be drawn which will secure all his rights. If the plaintiff had properly described his invention as it actually exists, his patent would have been good, for then the combination would have appeared.

But, in order to help out this part of the case, the drawings have been referred to. They show the combined thing, it is true, but the specification is silent as to the drawings, which are not necessarily to be taken as a part of it. If the specification itself made reference to the drawing, then they would become a part of it, and might be referred to for the purpose of elucidating any thing obscure in the description. But here the description is perfect without a drawing, and most probably a mechanic could make the contrivance, without resorting to the drawings at all, for explanation. The specification very clearly describes the revolving top plate, part by part, and in the summary, the plaintiff claims the entire thing described,—not as a combination, but as consisting of constituent parts, which he himself had discovered. Here lies his error, and upon this ground his action must fail. That my views on this subject may be clearly understood, I adopt the language of Lord Eldon, in the case of Hill vs. Thompson, [3 Merival's Rep., p. 621,] as containing what I consider a concise summary of the law on this point. He observes that "the judge, in his direction to the jury, has stated it as the law on the subject of patents, *first*, that the invention must be novel; *secondly*, that it must be useful; and *thirdly*, that the specification must be intelligible. I will go further, and say, that not only must the invention be novel and useful, and the specification intelligible, but also that the specification must not attempt to cover more than that which, being both matter of *actual* discovery, and of *useful* discovery, is the only proper subject for the protection of a patent. And I am compelled to add, that if a patentee seeks by his specification any more than he is strictly entitled to, his patent is thereby rendered ineffectual, even to the extent to which he would be otherwise fairly entitled. On the other hand, there may be a valid patent for a new combination of materials previously in use for the same purpose, or for a new method of applying such materials. But, in order to its being effectual, the specification must clearly express that it is in respect of such new combination, or application, and of that only, and not lay claim to the merit of original invention, in the use of the materials. If there be a patent both for a machine, and for an improvement in the use of it, and it cannot be supported for the machine, although it might for the improvement merely, it is good for nothing altogether, on account of its attempting to cover too much."

After a full view of this case, I am compelled most reluctantly to come to the conclusion that the plaintiff has undertaken to secure more than he has a right to claim, and in my view of the law he cannot recover. He should have patented his combination, and not his constituent parts. I regret this result the more because I consider that the plaintiff has invented a machine or contrivance, ingenious in itself, and highly useful for the purposes to which it is to be applied. I would protect him if I could conscientiously do so, under the views of the law which I have taken, and I consider the whole matter rather as a question of law for the court, than as a question of fact for the jury. If, however, the parties prefer to go to the jury upon any of the matters in issue, they have a right to take that course—but I would choose, if I could, to put the cause in that shape which would be most likely to secure the plaintiff's rights, if I have mistaken the law applicable to the case, or given an incorrect construction of the patent.

[The plaintiff voluntarily submitted to a nonsuit, with leave to move to set it aside hereafter.]

Note.—The above opinion expressed to the jury in said cause, was taken down at the time by one of the Counsel for the plaintiff—was then shown

to Judge Thompson, by him examined and approved, and is published as corrected by him. S. P. STAPLES.

S. P. Staples, J. P. Hall, and J. R. Staples were for the plaintiff.

R. M. Sherman, of Connecticut, Hugh Maxwell, Mr. Ormsby, of Rutland, Vt. and Mr. Harris of Albany, were for the defendant.

Remarks by the Editor.—It is truly gratifying to those who take a deep interest in the progress of the useful arts, to witness the change which has taken place within a few years in the tone of the decisions of the courts both of this country, and of England, where the rights of patentees have been concerned. Several of the judges in both countries appeared, formerly, to partake of the popular prejudice against patentees, as monopolists, whose claims ought, if possible, to be resisted; and many patents have been vacated upon grounds which we believe would now be generally deemed frivolous. It is not improbable that the name of "the Statute of Monopolies" by which the law of the 21st of James 1st, was designated, might itself have contributed towards the producing of such a result. At all events we consider the fact as notorious, and the difference at the present day as perfectly manifest. The foregoing report may serve to illustrate the position, which, were it necessary, might be sustained by numerous examples.

The patent laws of England, and of this country, are based upon the same principles, and the decisions of the English courts are, in consequence, cited in ours; there are, however, some provisions in our statutes, not contained in the British, and these of course, must govern our courts in those points to which they relate, and it has appeared to us that in one particular of this description, the foregoing decision may be considered as in some degree defective.

In the English statutes there is no provision whatever making it necessary to accompany the specification of a patent for machinery with drawings. "It was also formerly considered that the words of a specification ought of themselves to be sufficiently descriptive of the improvements, that the specification ought to contain within itself all the necessary information, without the necessity of having recourse to a diagram; and that if a diagram were given, it ought to be merely taken as an illustration, and not constituting a principal, or essential part of the specification; and therefore that a person was not bound to look at the diagram to learn the invention. But a very learned judge has however held that if a drawing, or figure, enable a workman of ordinary skill to construct the improvement, it is as good as any written description." Godson on patents, p. 119, edit. 1823. In the act of Congress of Feb. 21st, 1793, sec. 4, it is provided that the patentee shall not only describe his invention "in such full clear and exact terms as to distinguish the same from all other things before known," but also that "he shall accompany *the whole* with drawings and written references where the nature of the case *admits* of drawings." Under this provision we cannot resist the conviction that in every thing which *admits of drawings*, these drawings and written references, imperatively required by the statute, do make a component and necessary part of the specification, and that they are not to be taken as merely an illustration. In the drawing up of specifications of things which "admit of drawings" it would always be advantageous to refer to them in the body of the specification, and the only reason for omitting this is to save expense, as, in such cases, two copies of the drawings are required, one to attach to the patent, and the other to remain in the office. The practice of the office, and not the requirements of the law, has made a copy of the specification a component part of the patent; this practice arose from the impossibility of

carrying that part of the law into effect, under a literal construction of it, which requires that the patent shall contain "a short description of the said invention, or discovery." A specification which is without written references to drawings, might be considered as fulfilling this intention; but not so where it contains within itself references to the drawings, as it could not, in that case, be undersood, without attaching these also to the patent.

There are some points relating to this subject which we have left untouched, although we think them of much importance, but more space would be required for their investigation than it is thought proper to occupy at present, and they are therefore omitted.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

On making Sugar from Plants which thrive in the Temperate Zone, and north of the Climate where the Sugar Cane can be cultivated with success.

The article Sugar, strictly considered, ranks amongst the luxuries of life; but its pleasant taste, good qualities, and our habit of using it, has made the luxury a necessary article to a very large portion of the citizens of the United States.

Through various channels, the public are informed, that in consequence of measures adopted into the colonial policy of foreign nations, the process by which sugar has heretofore been produced, will be much deranged, and the supply greatly diminished.

The only concern that the Franklin Institute has with measures of this kind is, to bring scientific power to bear upon them, so as to reduce to its lowest point, their tendency to do ill, and to carry their capacity of doing good to its maximum. If the change of colonial policy, that is spoken of, should lead to a diminished supply, this will be followed by an increased price; and much privation of comfort must be experienced, until people acquire the habit of doing without sugar, should no new mode be discovered by which the article can be produced.

In this stage of the business, there is a propriety in the Franklin Institute turning its attention to making the citizens of the United States acquainted with what has been done in producing Sugar from plants growing in forty-eight degrees of north latitude. It is impossible, at this time, to appreciate the value of the services conferred on society, by the labours and discoveries of the French chemists, who have shown to the world, that a supply of sugar is to be had from plants growing so far north. These discoveries will prove one of the great scientific victories that characterise the chemistry of this age.

Translations of all that has been published in France, on this subject, if presented to the patrons of the Journal of the Franklin Institute, would be of great value, not only to them, but to the whole nation; the information contained in the French treatises, will be rendered still more valuable, if they are followed by essays from men of science, in our own country, who are acquainted with its soil, climate, agricultural and manufacturing resources. Although the natural circumstances of the United States, evidently arefavourable to this branch of agriculture, the subject has had little, if any attention bestowed upon it, we are almost ignorant of all that has been done or written about it.

The beet, and some other sacchariferous roots, when cultivated in France, mature their saccharine juices so perfectly, that they admit of chrystalization. There is every reason to presume that the same plants, with equally good cultivation, would advance to higher perfection throughout the

United States; and this greater perfection must be the result of our warmer summer.

The weight of beets and roots that might be grown to make Sugar from, is so great, that the sugar farmer, in most instances, would necessarily become the sugar maker; be his own chemist, and have his own laboratory: for in fact, the planter's sugar house is a laboratory,—only that the Pennsylvania and Ohio sugar house will differ from the Jamaica one, by having for a companion, the English cow-shed; for it must be recollected that the refuse or pulp of beets will feed cattle, whereas the squeezed cane is worthless trash.

The readers of the Journal will see that the present paper has solely in view to awaken their attention to a subject of great importance, in its relations to agriculture, manufactures, commerce, and the comforts of society. This is only doing what the Institute, on former occasions, has effected, through the publications in the Journal, by exhibitions, and by premiums. By these means, it has brought forth the energies of men of talents, and the result has been the supplying ourselves with many things, the want of which would now be felt, as a very great calamity. J. R.

January 12, 1836.

Remarks and Inquiries respecting Mr. Avery's Patent Steam Engine.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir—You have doubtless seen in a late number of the New York Mechanic's Magazine, (the one for September I think) an engraved drawing of "Avery's Rotary Steam Engine," accompanied by a description. It is generally believed that this engine has been *secured* to Mr. Avery by patent. I have always supposed the main object of the patent law to be, the *protection* of *original inventors* in the enjoyment of whatever pecuniary advantages they may fairly derive from their useful inventions.

That Mr. Avery's engine, or one constructed upon the same principle of action, though perhaps somewhat different in detail, will be found in some situations a convenient and economical machine, I do not doubt. Indeed, I know some persons who would like to make use of such engines, but who are, some of them unable, and all unwilling, to pay Mr. Avery for the privilege of doing that which they feel themselves equally at liberty to do with himself. My reasons for doubting the validity of his patent, may be found, *first*, by referring to the September number of the New York Mechanics' Magazine for 1833, in which is given a drawing and description of the beautiful contrivance of Hiero, the first account of which is said to have been published in the year 1571.

The principle upon which Mr. Avery's engine acts, will, I think, be seen at a glance, to be the same as that of Hiero's. *Secondly*, in a work by Oliver Evans, entitled the "Young Steam Engineer's Guide," published by Carey & Lea, page 93, the biographer of Mr. Watt, speaking of his first attempt to produce a direct circular motion by steam, says, "he (that is, Mr. Watt) then tried Parent's or Doctor Barker's Mill,* inclosing the arms in a metal drum which was immersed in cold water; the steam rushed rapidly along the pipe which was the axis, and it was hoped that a great

* Descriptions of Barker's Mill may be found by your readers, in Ferguson's Lectures, Nicholson's Operative Mechanic, and almost every reputable work on Mechanics now in use.

reaction would have been exerted at the ends of the arms, but it was almost nothing, the reason seems to be that the greatest part of the steam was condensed in the cold arms It was then tried in a drum kept boiling hot, but the impulse was now very small in comparison with the expense of steam." Upon this experiment Mr. Evans remarks as follows: "It is evident from this account that Mr. Watt has used *weak steam*, and placed dependance on the use of a condenser; had he in his experiment with Doctor Barker's Mill, lessened the apertures by which the steam issued, so as to confine the steam until the power in the boiler was equal to 100 lbs. to the inch, he would have been astonished to see it revolve about 1000 times a minute, supposing the rotary tube to have been three feet in length; I have tried the same experiment, but without the least hope of success, on any other principle than by confining the steam to increase its elasticity to a great degree. My rotary tube was three feet long, the elastic power of the steam about 56lbs. to the inch; it revolved with a velocity of about 700 to 1000 times a minute. The aperture by which the steam issued about $\frac{2}{10}$ of an inch diameter; it exerted more than the power of two men, and would answer to turn lathes, grindstones, &c. when fuel is cheap. I have specified and explained it in the Patent Office." Unfortunately, there is no date to this work of Mr. Evans, but I presume it can be readily ascertained in Philadelphia, when it was published, and probably when the specifications were entered at the Patent Office. But that it was done long before Mr. Avery's engine was thought of, I think there can be little room for doubt, as it appears from another part of the same work of Mr. Evans, page 96, that he *matured* his experiments upon the application of steam to a wheel, in the year 1784, which, as he states, he described in the Patent Office.

Under these circumstances, I cannot see what possible claim *Mr. Avery* can have to a patent for this invention; as to the drum which encloses the arms as represented in the drawing of his engine before referred to, I understand it is claimed as having been first applied to it, by a Mr. Clark, of some western town in this state.

By giving the foregoing an *early* insertion in your Magazine, you will sir, *essentially* oblige several of the friends and readers as well as promote the cause of justice. Should you be willing to express your own opinion as to the merits of this question, it would be deemed particularly valuable.

FAIR PLAY.

Remarks on the foregoing Communication, by the Editor.

It so happens that "Fair Play," and others, who desire information on the subject of Foster and Avery's Reacting Steam Engine, (commonly called Avery's) will, in the present number, have a full opportunity of seeing what constitutes the claim of these gentlemen to a patent for an improvement in this machine. They were fully informed respecting what had been attempted with engines similar in construction to their own, previously to their obtaining a patent; and it will be seen that they have confined their claim to improvement within very narrow limits, and so far as we are informed, their claim is a valid one. It may be said that their improvement is trifling; that, however, is their own concern, as those who do not need it are at full liberty to use the machine in any of the various forms which had been previously given to it, or to devise others which are new, without buying from them what may be deemed unimportant.

We are not sufficiently well informed respecting the comparative results

obtained from Avery's and the reciprocating, or Avery's and other rotary engines, to make up our minds respecting its real value; between four and five years, however, have elapsed since this engine was patented, and it has been at work at Syracuse, and various other places, during the whole of that time, so that those who have seen it, and who possess a competent knowledge of the subject, have had time enough to investigate it. Before the patent was obtained, we expressed to Mr. Avery, our general want of confidence in the real value of such engines, and our doubts respecting the importance of the improvements claimed; and we did not suppose that the career of the one in question would extend to two years, a length of life, greater than has usually fallen to the lot of rotary engines; it still lives, however, maugre our anticipations; and all the reports which we have received relating to it, tend to show that it has not yet exhibited the first symptoms of decline. Although we still adhere to the opinion, that upon a full comparison, the economy of a good reciprocating, will be greater than that of any rotary engine that has been, *or will hereafter be*, made, we most cheerfully confess that we have a much better opinion of Mr. Avery's, than we at first entertained; and, as to our wishes, they are that by the operation of this, and a hundred other contrivances, which we have esteemed of like value, we may be put entirely in the wrong; let the fact be well established, and we would be the first to make it public. Without putting in an undue claim to the *suaviter in modo*; we have sometimes thought that the tendency of onr animadversions upon patented inventions was to place us in the situation of "The best good-natured man, with the worst ill-natured muse;" it must be recollected, however, that we stand between the claimants of exclusive privileges, and the public.

With respect to the amount of novelty necessary to security, as a foundation for a patent, we think that the fair test of this is the utility of the improvement; if it renders that valuable which was of little comparative worth, it is enough, although it be no more than the addition of a screw, or of a peg. The views which we have adopted upon this subject, may be found at large in Vol. 8, p. 411 of this Journal. The article is a borrowed one, and well worth perusal. "The main object of the patent law is the *protection of original inventors* in the enjoyment of whatever pecuniary advantages they may fairly derive from their useful inventions," and in attaining this end, it is not possible to test them by comparative weights, or to measure them by any established scale; absolute quantity, however small, is all that can be required.

Civil Engineering.

Report to the President and Managers of the West Philadelphia Rail Road Company, by H. R. Campbell, *Civil Engineer.*

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen—I am directed by the President and Managers of the West Philadelphia Rail Road Company, to request the insertion in the Journal of the Franklin Institute, of the Report of their Engineer, accompanied by a map of the road.

This report contains some facts respecting the superiority of the Locomotive Engines made in this city, over those in use on the Columbia Rail Road which were imported from England, that are highly creditable to the

state of the arts in this country, and ought to be made known as extensively as possible. The work on the West Philadelphia Rail Road is in a forward state, and will be completed within the period contemplated.

Very respectfully, your obedient servant,

THOMAS FLETCHER.

To the President and Managers of the West Philadelphia Rail Road Company.

GENTLEMEN—I have the honor to report, that the line of the West Philadelphia Rail Road, has been located in conformity with instructions received from the Board. The ground over which it is traced is well adapted to the construction and grade of the road. The excavations and embankments are generally light, and by no means of an expensive character. But few small streams are crossed, and consequently but few culverts and bridges will be required, which will be built of stone in the most permanent and durable manner. In the location of the route particular care has been taken to avoid curves, and no curves have been made upon a less radius than four thousand feet.

The maximum rise of the graded surface of the road, is 46 feet per mile, which is only one foot per mile more than the maximum grade of the main line of the Columbia and Philadelphia Rail Road. A small portion of the line is level, and about one and a half miles are graded at 38 feet per mile. The average grade is $43\frac{3}{10}$ feet per mile, its length being $7\frac{1}{2}$ miles, and total rise 325 feet.

From its juncture with the Columbia Rail Road, a short distance below the Buck Tavern, the route is nearly straight to the Market Street Permanent Bridge over the Schuylkill River, and more direct than the main line of the Columbia Rail Road. By its completion a new outlet will be opened to the travel and transportation of the Columbia Rail Road, and the inclined plane at Belmont will be avoided. The distance from the city of Philadelphia to the head of the inclined plane is about 4 miles; the nearest point to which locomotive engines can approach the city. By the West Philadelphia Rail Road, locomotives can carry their trains to the line of the city proper, at Market Street Permanent Bridge, and to the tide water of the Schuylkill opposite the city.

Trains of cars by this route, propelled by locomotive engines, will gain one hour in advance of those which pass over the inclined plane, by the main route of the Columbia Rail Road. This circumstance is alone a sufficient inducement to divert the travel and a large portion of the transportation from that Rail Road. Statements have been made in the public papers, since the commencement of the West Philadelphia Rail Road, that the construction of a line was contemplated by the Canal Commissioners of the State, by which the inclined plane is to be avoided, without exceeding a grade of 25 feet per mile, and an increased distance of two miles It is due to the stockholders of the West Philadelphia Rail Road and to the public, to state, that no such route exists, and that the name of the engineer, given as authority upon which the statement was made, was used without his permission or consent.

The importance of avoiding inclined planes upon roads constructed for the accommodation of passengers traveling, is beginning to be justly appreciated. By reference to the recent report of the Baltimore and Ohio Rail Road Company, it will be found, that measures have been taken by

them, to abandon those parts of their road upon which inclined planes have been constructed, and to construct new lines upon which locomotive engines can ascend without the aid of stationary power. By experiments made on the Columbia Rail Road with locomotive engines, the question has been settled, that 45 feet per mile, is an inclination upon which that species of power can be applied with more advantage than any other. The fact, that the original design was abandoned, of adopting stationary engine power on the Rainhill and Sutton inclined planes of 55 feet per mile, on the Liverpool and Manchester Rail Road, in England, to the more advantageous use of locomotive engines, might also be adduced as evidence, that even steeper grades, may be safely adopted.

The locomotive engines on the Columbia Rail Road, which were manufactured by Mr. Baldwin, of Philadelphia, carry trains of 20 and 24 cars, containing each three tons of merchandise, up 45 feet grades at 10 to 12 miles per hour; while engines of English constructure, from the works of Robert Stephenson, Esq. the celebrated engineer, carry upon the same road only 14 cars, at the same rate of speed. This great difference is produced by the superior arrangement and mechanical application of power to Mr. Baldwin's engine, and not from any difference in the weight and *adhesive* power of the respective machines.

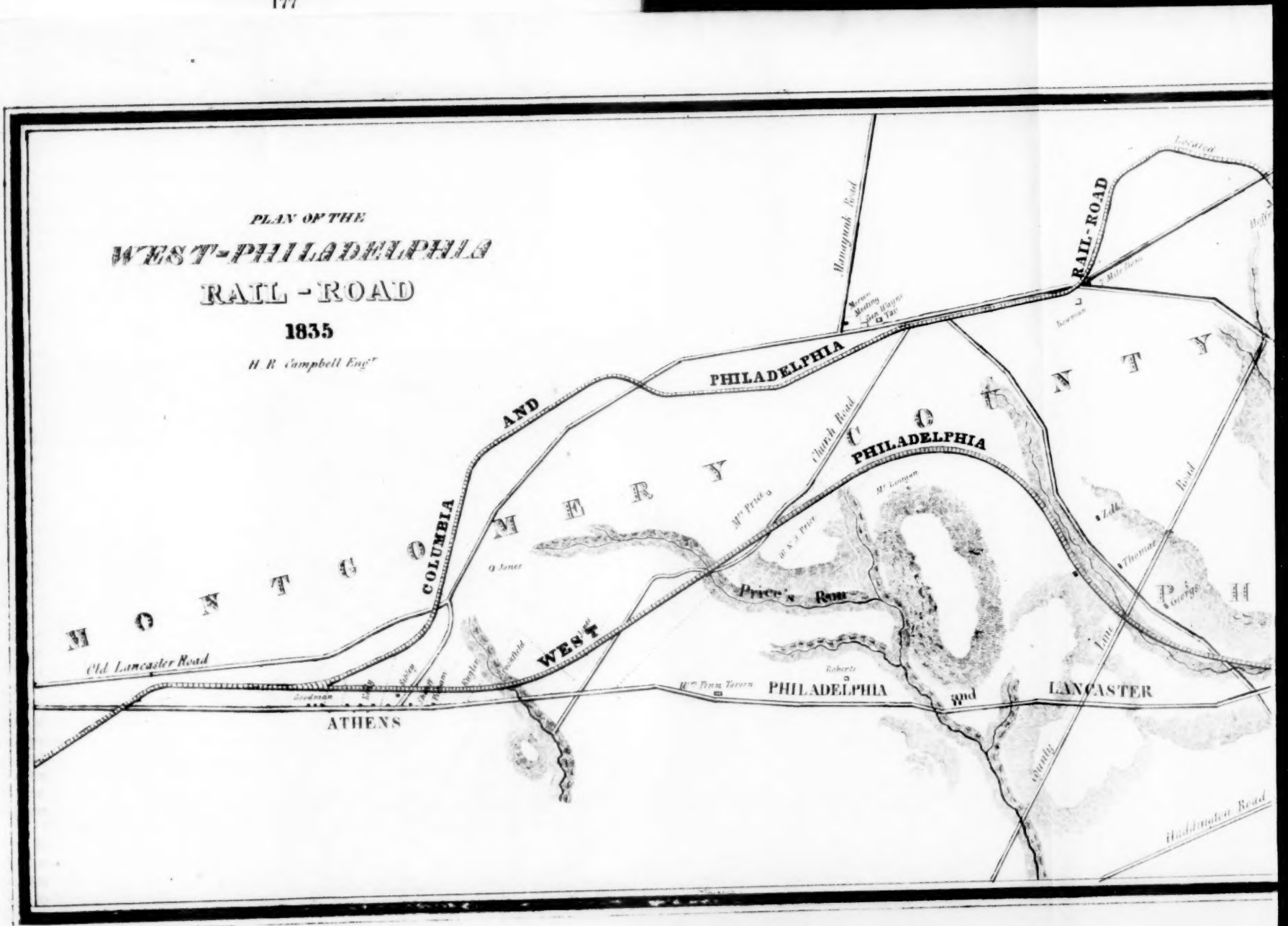
It has been clearly ascertained that Mr. Baldwin's engines, under all circumstances, are able to generate more steam than is adequate to overcome the adhesion of the wheels upon the surface of the rails, while those of English construction are unable to keep up a sufficient supply. These facts are mentioned as evidence of the progressive improvements in the science and construction of locomotive engines, and of the perfection to which their manufacture has arrived in our own country. The durability of these engines, and the amount of annual repairs, are not less striking than the result of their effective force.

Enough, it is presumed, has been said to prove conclusively, the superiority of the route of the West Philadelphia Rail Road, over that portion of the Columbia Rail Road which it is destined to rival. With regard to the comparative distance of the two lines, the former is about half a mile shorter than the latter, from the intersection of Broad and Market Streets. The whole cost of the West Philadelphia Rail Road, including a double track of edge rails, laid on foundations of locust timber, will be $250,000. The work is all under contract and rapidly progressing to completion.

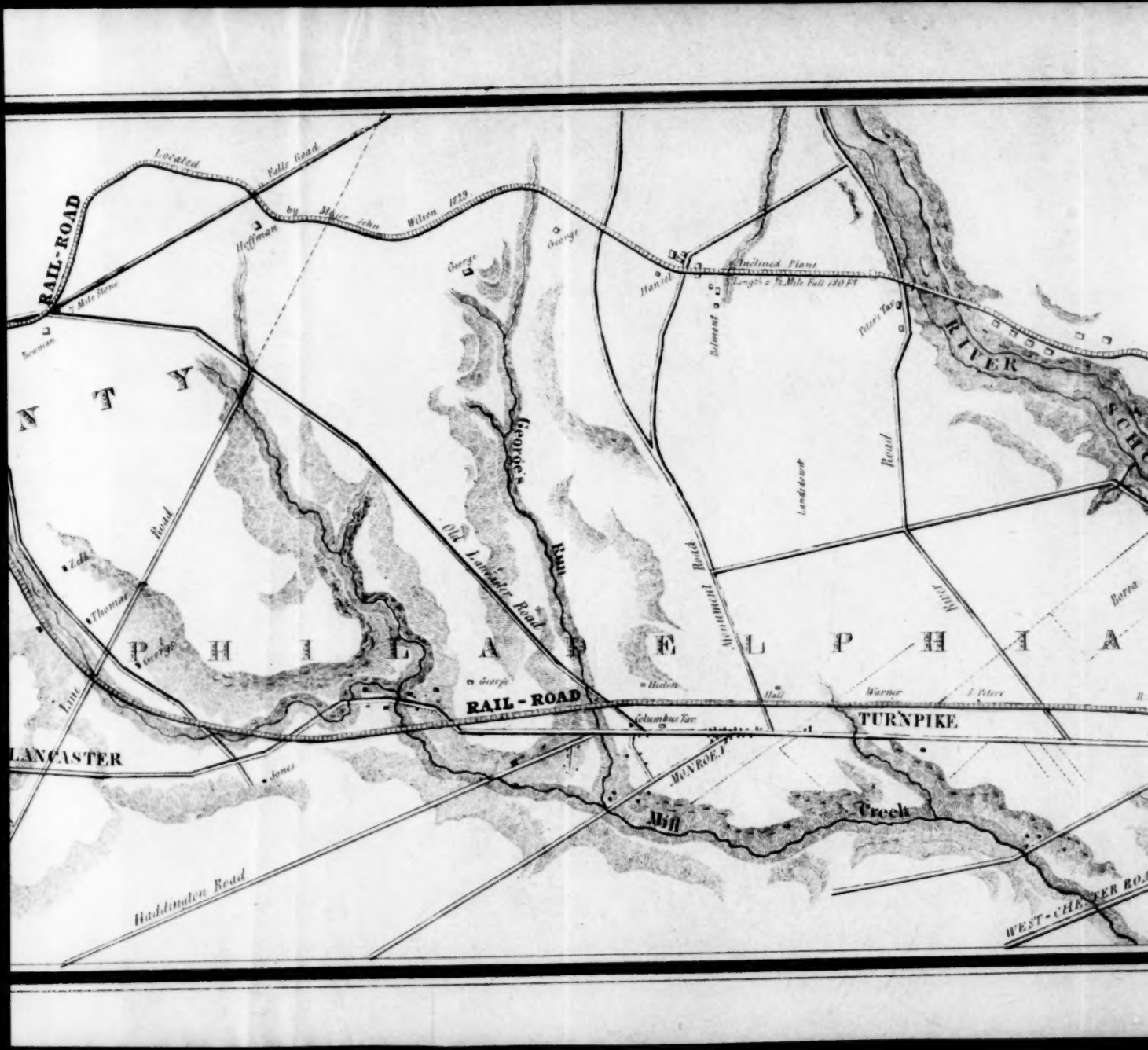
The grading will be finished by the 1st of May, 1836, and the rails will be laid ready for travel by the 1st of August following. Contracts have been made for iron edge rails, of a pattern similar to those of the Camden and Amboy Rail Road, to weigh 60 lbs. per lineal yard, and also for all the materials necessary to complete the work, which are to be delivered in all the month of April next. The Board have every reason to be satisfied with the progress of the work under the respective contracts. The prices are generally fair, and no obstacles exist to the completion of the road within the time specified in the contracts.

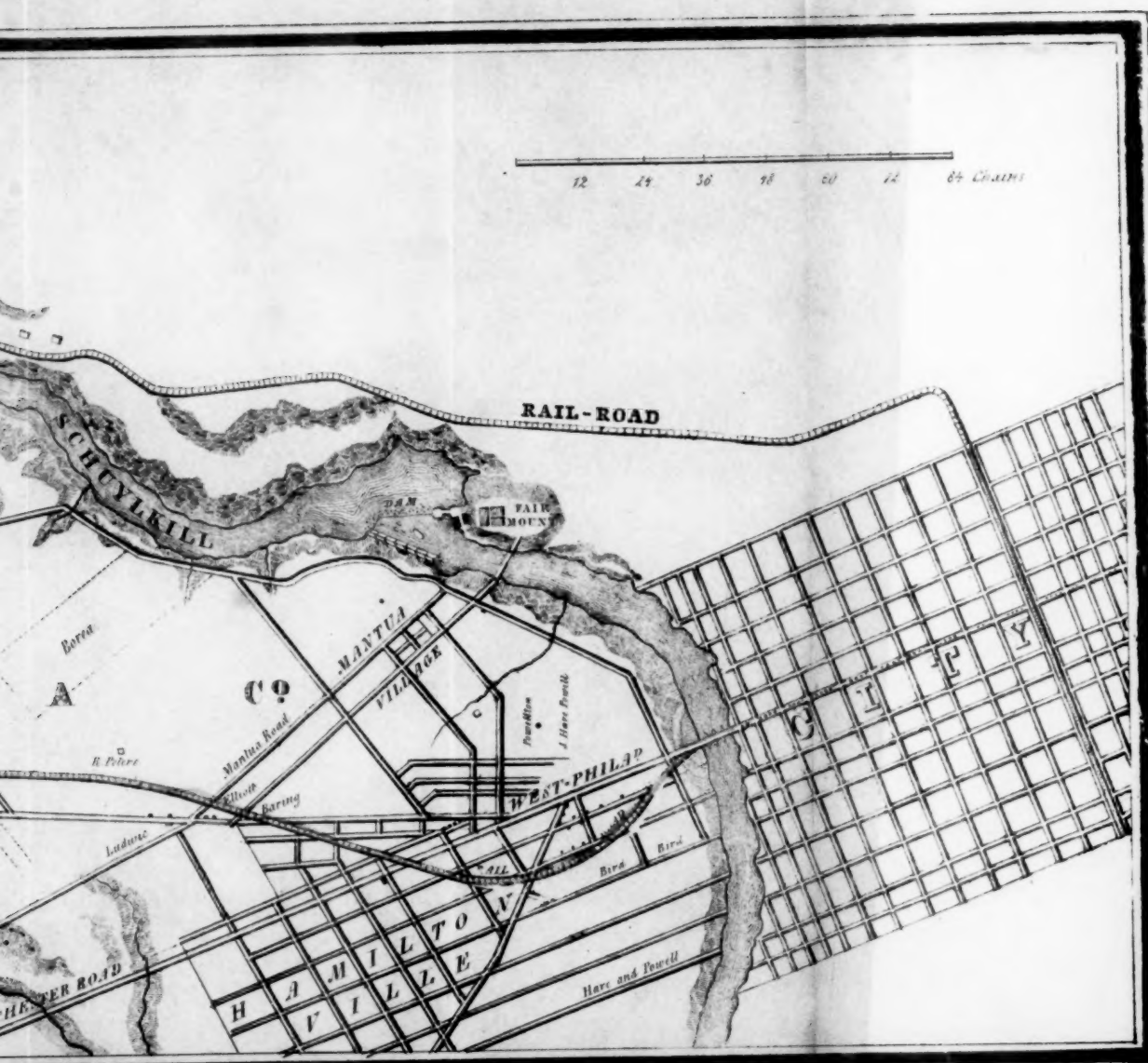
H. R. Campbell,
Engineer of the West Philadelphia Rail Road.

Philadelphia, October 15, 1835.



On Stone by G. Hamm


RAIL-ROAD
Located
Falls Road
by
Major John Wilcox 1829
Hoffman
Mile Stone
Inclined Plane
Length = ¾ Mile Fall 180 FT
Peters Tav
RIVER
Belmont
Landsdowne
Road
George's Run
Old Lancaster Road
Monument Road
Thomas
Road
PHILADELPHIA
RAIL-ROAD
TURNPIKE
Columbus Tav
Hall
Warner
LANCASTER
Jones
McAVOY
Mill
Creek
Haddington Road
WEST-CHESTER ROA



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Physical Science.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Experiments on Endosmosis. *By* JOHN W. DRAPER, M. D. *Christiansville, Mecklenberg, Va.*

1. The interstices which exist in a great variety of bodies, may be looked upon as a large system of capillary tubes, into which we should be prepared to expect, that bodies of all kinds might pass. A drop of water, placed upon a porous stone or chalk, sinks into it rapidly, but the value of the observation is lost, because it is common. If that water contained a colouring matter, we should find that in sinking into the chalk, the colour would be left on the surface. But here again common place principles dictate a ready answer, the interstices of the chalk may be supposed to be too small, to admit the colouring matter to pass, or perhaps some incongruity of shape might afford a barrier; yet, how upon these principles shall we explain, that mercury and other bodies remain unmoved upon the porous mass, and show no ability to go through it, when they will pass with readiness into the densest and closest substances, as gold. No principle of coaptation will explain why quicksilver will not rise in a tube of glass, or why water rises at all. We are thrown at once to refer the whole matter, to the the chemical conditions of the bodies on which we operate, and we quickly infer, that fluids do not pass into pores by soaking or leakage, or any such commonplace principle, but that it is an action determined by certain laws that have reference to the condition of each body, separately, and their relation to each other. A question therefore naturally arises, as to the peculiar operation of those pores, and how changes in their position, size and shape, would affect the results of their action. A class of these phenomena is quite independent of pores of any sensible size, when no leakage or oozing can be suspected. A piece of sugar dissolving in water, diffuses itself into every part of the menstruum. Among those excessively small interstices, that exist between the least atoms of the water, its particles find a dwelling, where they are sheltered from all those forces that act so energetically on the great masses of matter. Independent of gravity, they move freely in every direction, and far from settling in those positions to which they might tend from their weight, they are simultaneously and equally found, in every portion of the solvent. This condition of things does not indicate a passive state, but would rather teach, that a very active and powerful force is in operation, a force that can neutralize the action of gravity, and other external agents. It is essential, therefore, clearly to understand the circumstances of this absorption; it may take place independently of apertures, pores or vessels, it may take place between gases and gases, gases and vapors, or liquids, or solids, or mutually and indiscriminately among them all.

2. When a liquid rises in a capillary tube, only those portions are under the direct influence of the attractive force of the tube, which are nearest to it; the central columns being entirely unaffected. Also, when water jets out through a narrow pipe, it is only those portions that are directly in contact with the sides of the pipe, that are subject to its resisting influences, any disturbance which the central particles feel, arising only indirectly from their cohesion. The same applies in the passage of liquids among pores, the diameter of these pores amounting to a certain size, they will admit a pas-

sage, without exerting any direct influence. Thus, a pore in a piece of charcoal, may suffer a column of water to go through it, without in anywise affecting the central portion of that column, by reason of its size, but should the diameter of the pore be made to decrease, it is obvious a limit might finally be reached, where every particle that passed, should come under the direct influence of the physical force exerted by the pore, and none pass by mere leakage, or oozing.

3. This leads us to consider the different effects that may ensue when the same liquid or gas passes through pores of various sizes, in the same solid. An example may perhaps illustrate the results. The walls of a pore are so constituted, as to allow an easy passage of one gas, as oxygen, along them, and afford more or less resistance to another, as nitrogen gas. Now, if we suppose this pore to be of very large size, and atmospheric air to be passing through it, little or no change will happen, in the constitution of the passing gas, all the internal parts of the current being out of the reach of the walls of the pore; but should the diameter of the pore be reduced to the diameter of an atom of the compound gas, or thereabouts, the oxygen finding little or no resistance, would glide through, and the nitrogen be retained. A perfect decomposition happening. This shows the importance in all investigations relative to the Endosmosis, or transit of bodies through pores, to bear in mind, that when those pores have a certain diameter, the results of experiments made on them are illusive; not representing alone the nature and value of the force exerted by the walls of the pore, but showing effects depending also, on the cohesion and other properties of the passing body.

4. These observations apply to those experiments which have been made to illustrate the phenomena of endosmosis by forcing gases through plugs of stucco, which are systems of capillary tubes of large size. Experiments on charcoal, plaster, &c., are also open to the same strictures. Had these only been resorted to, not the simplest phenomena of endosmosis could have been revealed. The disturbance of hydrostatic level, which is so well shown by a sheet of gum elastic, or an animal membrane, cannot be produced by the use of plugs, with large pores or systems of capillary tubes.

5. It might at first be expected, that as the diameter of a pore decreased, its indisposition to admit a foreign body, would increase, but it is not so—that foreign atom does not insinuate itself in a passive manner; nor does it go through the pore, merely because it meets with no resistance. There is an active and very energetic force in play, a force that is even greater, than the cohesion of the parts of the pore itself. Hence, under like circumstances, the smallness of such a pore is no bar to its receiving and transmitting foreign atoms, but very often in an experimental point of view is the most favourable condition, under which we can study its action without any retarding or complex causes.

6. There are some experimental illustrations of the fact, that closeness of texture is no hindrance to the passage of suitable bodies. I took a narrow glass pipe, about an eight of an inch in diameter, and dipping an end of it into melted gum lac, expanded thereon a bubble of that substance, by blowing at the other extremity. In this way, after a few trials, it may be made so thin as to be translucent. Such a bubble, with air from the lungs in its interior, being exposed to an atmosphere of ammoniacal gas, allows a free passage to it. A singular change in the appearance of the thin membranous bag takes place during the experiment, from being brown in the thicker parts and whitish in those that are more translucent, it becomes of one uniform flesh colour. Now, in this state, it may be regarded as one of the most

impervious of all resinous bodies, and certainly of them all it has the closest texture, yet after it has thus been exposed for a short time to ammonia, we find on passing into its interior a little reddened litmus water, that the gas is present in large quantity, and must of course have been transmitted, along the pores in the resin.

7. On the top of a tube which contained atmospheric air, and a piece of litmus paper, tinged red by the fumes of muriatic acid, I fastened very carefully a piece of gold leaf, two tenths of an inch in diameter, with gum water, and suffered it to dry. The gold leaf, when examined with a lens by transmitted light, appeared all over of an uniform pea green colour, nor could any hole or flaw be perceived in it. It was covered with a jar of ammonia, on the mercurial trough ; the level of the mercury, on the inside and outside, being regulated. The gas went through the gold leaf rapidly, and in a very short time the test paper became uniformly blue. On using carbonic acid, or sulphuretted hydrogen, the action was very nearly as instantaneous.

8. I split, with a lancet, a thin plate of Siberian mica, which for the most part appeared of a flame colour, but in places where it was unequally thick, a blue or a red. This lamina, when substituted for gold leaf in the last experiment, suffered ammonia to pass through it. A similar plate of sulphate of lime, from Sheerness, England, suffered half a cubic inch of carbonic acid to pass through it in forty minutes. Atmospheric air in all these cases was on the other side.

9. These permeations, which we have noticed to take place so rapidly under favourable circumstances, occur likewise more slowly in nature. A sea shell, for instance, deposited in that formation called London clay, in course of time loses its coagulated albumen, then its carbonate of lime, and its other ingredients, simultaneously or successively. These are replaced by the sulphuret of iron, by alumina, oxide of iron, &c., which form together a mass of so close a texture, that it can give sparks by collision. Under such circumstances as those which occur along the coast of the island of Shepply, a thin plate of carbonate of lime is permeated readily by bisulphuret of iron, so that there is a continued deposition and accumulation of that substance, in the interior of a thin shell. Hence the production of that immense quantity of fossil shells, which is there used for the purpose of manufacturing copperas for commerce. Slow motions of the same kind occur, when alloys are buried under the ground, or placed in exposed situations, a silver Roman coin has thus been known to part with much of its copper, which formed a species of crystalization on its surface, the *patina* of antiquarians. It is in this way, that trinkets of gold, on which small quantities of mercury have fallen, gradually recover their original brilliance and purity. A number of facts of this kind, showing that even in the most solid of metallic textures, motions may take place, might be referred to: these have been well considered by Boyle, in his tract on the languid motions of bodies.

10. Caoutchouc, or gum elastic, is the substance which of all others has furnished the most unexceptionable results, on studying the phenomena of endosmosis. It however at times exerts a synthetic action, which so far as I know, has not yet been noticed. Having capped an open tube, with a thin piece of this substance, and thrown into it 200 measures of hydrogen gas, it was exposed to an atmosphere of 100 measures of oxygen, contained in a wider tube, into which it was raised. In eleven days the level in both tubes was considerably raised, and the barrier which was at first of a blackish co-

lour, became quite white. In sixteen days, the united volume of both gases was only 215 measures, this on analysis contained only 14 per cent. of oxygen. It may here be stated, that a like mixture of 100 of oxygen, and 200 of hydrogen, enclosed together in a tube by the side of the former, had undergone little or no diminution. Now a rough calculation shows, that about one thirteenth of the united volume of the gases had been condensed by the membrane into water, the remaining 62.35 parts of oxygen having combined, after some chemical manner with the substance of the caoutchouc, in the process of bleaching it.

11. This result points out the condensing effect of a membrane, which often, in many arrangements, will have no small influence. Thus in Dr. Mitchell's experiment, where two bent tubes are screwed together, with a piece of gum elastic between them, the one tube containing oxygen, and the other a double volume of hydrogen, we should be led to expect, from the common theory of endosmosis, that however much the levels in the two tubes might vary, relatively to each other, the united volume of the gases ought to remain constant. If the level in the hydrogen tube rose an inch, ought not the level in the oxygen tube to sink an inch? But an appeal to experiment shows, that such is by no means the fact; to a certain extent, the volume of gas in the tubes is constantly diminishing, it is not due to leakage into the free atmosphere, between the membrane and the glass, that presses it, at least not entirely so, a part of the gases is condensed by the direct action of the barrier, to form water, and the remainder unites chemically with it. In some instances the action is still more obvious. If a vessel of atmospheric air, the mouth of which is covered by a piece of india rubber, be immersed in an atmosphere of deutoxide of nitrogen, it will not be found that red fumes will appear in the vessel, nor any other obvious indication of the presence of the deutoxide then, but the membrane soon begins to change its colour, and from being diaphanous becomes of a dirty umber brown, the volumes of the gases on both sides of it diminishing.

12. Into a tube which was covered with India rubber, and exposed to the free atmosphere, I placed 100 measures of atmospheric air, and 42 of hydrogen gas, as it stood on the shelf of the pneumatic trough, being anxious to see if any passage of the gases would ensue, as the oxygen and hydrogen in the mixture, were in nearly a due proportion to form water. Motion at once began, the level of the water in the tube rising for several hours. In the course of a few days, only a trace of hydrogen was discoverable, the remaining gas differing very slightly from atmospheric air. The same was repeated with a tube closed by a serous membrane, kept continually moistened, when all motion appeared at an end, analysis showed that there was only $\frac{1}{10}$ of the whole volume of hydrogen beneath the membrane.

13. These experiments which were repeated again and again, with the same results, establish an important doctrine. If a gas be confined beneath a system of pores, the other extremity of which communicates with another gas, movement will ensue, until the constitution of the gas on both sides of the system is alike. If oxygen and hydrogen be thus placed, they will mutually pass to each other, nor will that motion cease, until the resulting compound, on both sides of the membrane, is the same chemically. This endeavour to an equalization of constitution, takes place under all circumstances, it may perhaps be partially arrested by the condensing action of the barrier. (11.) There are therefore two prominent conditions under which the phenomena of endosmosis may be regarded: 1st. During the state of motion. 2nd. After an equilibrium is obtained.

14. Aided by this principle, we can explain how mixtures of gases would comport themselves, when exposed to free atmospheres, or when shut up in close chambers. The arrangements of (12) will serve as an illustration, here we have a mixture of atmospheric air and hydrogen, exposed to the free atmosphere. It is evident, that in pursuance of an attempt to gain an equilibrium, a portion of air from the atmosphere should pass inwards through the membrane, and a portion of hydrogen pass out. But as soon as the hydrogen is beyond the outside of the membrane, it is dissipated by aerial currents, or otherwise diffused in the mass of the atmosphere, the condition of equilibrium being in no wise approached to, for so fast as the hydrogen escapes, it is carried off; there being continually hydrogen and atmospheric air on one side of the membrane, and only atmospheric air on the other. Equilibrium, therefore, can only be gained by the entire dissipation of the hydrogen into the free air, and accordingly experiment indicates, that when that equilibrium is gained, the hydrogen has vanished, and atmospheric air is found on both sides of the membrane. But very different would that action be, if the arrangements were included in a close chamber, as beneath a small glass bell; here, when the hydrogen comes out through the membrane, it does not escape, but continually accumulates, and motion ceases, and equilibrium is gained when the relative proportion of the gases outside the membrane, is the same as inside. Hydrogen, therefore, in this case is found on both sides of the barrier.

15. Before proceeding to give an account of the chemical changes, that may happen in virtue of the action of capillary forces, it is necessary to remark, that all the analyses of gaseous mixtures in which oxygen is an element, have been uniformly made by means of binoxide of nitrogen. Living in a climate where no dependance can be placed on the action of an electrical machine, and not possessing Dr. Hare's galvano-ignition apparatus, I was led by necessity to choose between spongy platina, and the binoxide of nitrogen. After an experience of some extent in the employment of this gas, it has not appeared to deceive me,—it is indeed an eligible method in gaseous analysis, where oxygen is concerned. The mode of manipulation is as follows: with the sliding rod eudiometer, throw 100 measures of the gas under trial, above the surface of water, that has been duly exposed to the atmosphere, and contained in an inverted bell, rather wide in proportion to its depth; one made of the belly of a glass retort, or a cupping glass, answers very well. Then add 100 measures of the binoxide of nitrogen, if the gas is suspected to be poor in oxygen, but 200 or more, if the gas is richer, always observing to have the binoxide in excess. After the lapse of a minute the absorption is complete; measure the residue, and one fourth of the diminution gives the volume of oxygen, this method is analogous to that of Gay Lussac. Some idea of its correctness may be formed from the circumstance, that of 73 analyses of the air, the mean result of the amount of oxygen is 20.58 per cent. My measuring rod divides each volume into decimals by a vernier arrangement; but for most purposes of analysis this is unnecessary.

16. It results from the observations which have been made on caoutchouc, by Dr. Mitchell, that oxygen passes with much more facility through it, than nitrogen gas. Atmospheric air is also reputed to be a mixture, and not a chemical compound; it was therefore an object to try, whether pure oxygen might not be obtained by forcing air through such a membrane. Filtering or in fact straining it through a gum elastic bag. A thin piece of this substance, was therefore tied tightly over a tube an inch in diameter, and six

inches long, the tube was then filled with mercury, in such a manner that the great weight might not burst the caoutchouc, it was then inverted, and exposed to the atmosphere. The membrane bulged into the tube, in a deep hemispherical form, in about an hour its under surface was studded with bubbles of gas, and in the course of time, several cubic inches passed. This, on analysis, by means of binoxide of nitrogen, was found not to differ sensibly from atmospheric air. A similar result was also obtained, when a thin serous membrane, a piece of peritoneum stripped from the liver, was substituted for the gum elastic. No indications whatever could be obtained, that atmospheric air was decomposed, during the process. Nor is it difficult to understand and explain how this happens, when a foreign force, equivalent to a pressure of six inches of mercury, is brought to bear so advantageously on the action of a very thin membrane, for in the case of the gum elastic, the thickness could not be estimated at more than $\frac{1}{300}$ of an inch, and the serous membrane was so porous, that it could not sustain so heavy a pressure, without immediate leakage; the united gas whatever it may be, is at once forced through, the barrier being unable to stop it. A case of the same kind is met with, when porous charcoal is used, pressure forces a gas through it entirely unchanged, but if the effects of that pressure be avoided, chemical decompositions may ensue of a decisive character, as we shall shortly have occasion to see. To obtain these chemical effects, it is necessary that the barrier should not only have no pores of sensible size, but that no adventitious or foreign forces, be brought to act on the passing gas; in proportion as these conditions are fulfilled, the success of the experiment is more perfect, and thus as we shall proceed to point out, it is possible to strain the nitrogen out of atmospheric air, and procure by that means oxygen of greater or less purity.

(TO BE CONTINUED.)

Historical Note on the Discovery of the non-conducting power of Ice. By A. D. BACHE, Prof. of Nat. Philos. and Chem., Univ. Penn.

In the fourth series of his electrical researches, Mr. Faraday devotes himself to the establishment of a "new law of electric conduction." In the course of experiments for this purpose, he says that he "was suddenly stopped by finding that ice was a non-conductor of electricity, and that, as soon as a thin film of it was interposed in the circuit of a very powerful [voltaic] battery, the transmission of electricity was prevented." This observation is made to lead to a beautiful train of research on the conducting powers of various oxides, salts, chlorides, &c., capable of existing in both the solid and liquid states. In these experiments, a galvanic battery of two troughs, containing twenty pairs of four inch plates, was used.

Similar results were obtained with electricity from the machine. A thickness of five-sixteenths of an inch of ice scarcely allowed the electricity to pass at all, though of this high tension.

It seems, then, that Mr. Faraday thought it necessary to investigate this fact, which he had accidentally observed in relation to galvanic electricity, in its application to electricity as evolved from the machine.

That ice is a non-conductor of electricity, thus evolved, was, however, well known to Doctor Franklin, and his associates; and whatever merit attaches to this discovery, which was considered a curious one, belongs to him, or to them.

In one of a series of letters to Mr. Peter Collinson, of London, dated in

1747 and 1748, in which he gives an account of experiments made by himself, Kinnersley, Hopkinson, and others, Doctor Franklin has the following remark: "A dry cake of ice, or an icicle held between two in a circle, likewise prevents the shock, which we would not expect, as water conducts it so perfectly well."

Again, in a paper on the aurora borealis, read before the Royal Academy of Sciences of Paris, in April, 1779, and entitled, "Suppositions and Conjectures towards forming an Hypothesis for the Explanation of the Aurora Borealis," the basis of his theory is this same want of conducting power. He says: "Water, though naturally a good conductor, will not conduct well when frozen into ice by a common degree of cold—not at all when the cold is extreme."

"The great cake of ice that eternally covers those [the polar] regions, may be too hard frozen to permit the electricity" "to enter the earth." "It may, therefore, be accumulated upon that ice."

Dr. Watson had previously affirmed ice to be a conductor; and, subsequently, Bergman and others were of the same opinion, doubtless from their not attending to the "dryness" of the ice. Bergman found reason to change his opinion, and Achard, Erman, and others, have confirmed the accuracy of Franklin's statement. These authorities have caused ice, at a low temperature, to be ranked among electrics, in the elementary works devoted to the subject.

As far as the passage from the solid to the liquid state is concerned, our electricians seem to have been better informed than the following sentence from the paper of Prof. Faraday, before referred to, supposes.

"This assumption (he says) of conducting power by bodies as soon as they pass from the solid to the liquid state, offers a new and extraordinary character, the existence of which, as far as I know, has not before been suspected."*

It is true that this remark applies particularly to galvanic electricity, but as Mr. Faraday repeated many of his results with the machine, to prove them to be coincident with the others, he obviously does not intend to limit his remarks. "All these effects," he says, "produced by using the common machine, and the voltaic battery, agree, therefore, with each other."† Again, "The conducting power of these bodies, when fluid, is very great."‡

In a letter to Cadwallader Colden, of New York, dated Philadelphia, April 23d, 1752, Dr. Franklin says, "I do not remember any experiment by which it appeared that highly rectified spirit will not conduct; perhaps you have made such. This I know, that wax, rosin, brimstone, and even glass, commonly reputed electrics *per se*, will, when in a fluid state, conduct pretty well. Glass will do it when only red hot."

He again states the same fact in the paper on the aurora, before referred to, thus: "A certain quantity of heat will make some bodies good conductors, that will not otherwise conduct."

"Thus, wax rendered fluid, and glass softened by heat, will both of them conduct."

"And water, though naturally a good conductor, will not conduct well when frozen into ice."

In these effects, our electricians saw only the general effect of heat on

* Prof. Faraday's experimental researches in Electricity. Fourth series. Art. 412, Royal Soc. Trans., 1833.

† Ibid., art. 431.

‡ Ibid., art. 430.

the conducting power of bodies, while Mr. Faraday ranks the effects observed by him in quite a different class, and founds upon them the general law that decomposition is necessary to conduction.

Philadelphia, January, 1836.

Abstract of a paper on the Naïades, &c. By Isaac Lea, Esq., Mem. Am. Phil. Soc., &c. &c.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—By direction of the American Philosophical Society, I send you an abstract of a paper on the Naïades, &c., the last part of which was read at the recent meeting of the society, February 5th, 1836. This continuation contained descriptions of the following new species.

Unio Zeiglerianus,	Unio simus,	Unio Hopetonensis.
" Medellinus,	" glaber,	" Roanokensis.
" notatus,	" gibber,	" lugubris,
" Mühfeldianus,	" Cumberlandianus,	" creperus,
" Tampicoensis,	" pumilis,	" Lecontianus,
" Carbonarius,	" Javensis,	" Barnesianus.
" Vanuxemensis,	" folliculatus,	

Anodonta cylindracea,	Margaritana Holstonia,
" Wardiana,	" fabula,
" salmonia,	" deltoidea.
" Buchanensis,	

In the previous parts of Mr. Lea's paper, descriptions of the following new species were read to the society.

Symphynota Bengalensis.

Unio obscurus,	Unio solidus,	Unio porrectus,
" Vaughanianus,	" coccineus,	" jejenus,
" arctior,	" Hydianus,	" venustus,
" pulcher,	" turgidus,	" interruptus,

Unio lamellatus.

Anodonta ovata,	Physa aurea,
" gigantea,	Paludina hyalina,
Ampullaria Pealiana,	Melania plicata,
Melania inflata,	Paludina pallida.

Also, a new and interesting land shell, sent from Brazil, by Dr. Ruschenberger, for which Mr. Lea considered it necessary to form a new genus, which he calls *Megaspira;* the donor's name is given as the specific one,—Megaspira Ruschenbergiana. Yours, &c. A. D. Bache,

One of the Secretaries Am. Philos. Soc.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Review of a "Geological Report of an Examination, made in 1834, *of the Elevated Country between the Missouri and Red rivers. By G. W. Featherstonhaugh, U. S. Geologist. Published by order of both Houses of Congress. Washington: Printed by Gales & Seaton.* 1835."

(continued from p. 117)

Mr. Featherstonhaugh gives a pleasing description of the Hot Springs; it differs however in some respects from the account given of them in Mr.

James' History of Col. Long's first expedition to the Rocky Mountains, for Mr. J. states that the substance deposited from them is a siliceo-calcareous matter, which Mr. F. calls a travertin, or pure carbonate of lime; it would I think seem probable, that in a country where the silicifying process is so abundantly manifest, thermal waters, such as those of the Washita Springs, would contain silex; the difference however in these accounts is of little importance. Our author in speaking of the Washita oilstone, describes it as a silicious mineral, which he calls a novaculite; in this he differs from the generality of mineralogists who consider this latter mineral as a species of the argillite; whether therefore the Washita oilstone is a silicious stone to which the name of novaculite is improperly applied; or whether being a novaculite, he is mistaken in ascribing to it a silicious character remains to be determined. On leaving the Washita Springs, he continued his route to the Caddo river, and from thence to the Little Missouri, and mentions, that in the vicinity of the latter stream, he met with a "singularly black waxy soil of a carbonaceous colour;" as, independently of the singularity of its *colour* there is something unusual in such a texture of soil, it might be wished, that he had analyzed it, and given us some more particular account of its peculiarities. He next enters the Prairie country, and we are led to expect some interesting information on the subject of their geological character and origin, from his expressions of "sincere pleasure" at "finding himself upon geological grounds, with which he was well acquainted," (p. 74). His remarks on their geological formation are however very concise, being in a great measure confined to the observation, that he found the fossil shells in the Prairies identical with those of the New-Jersey green-sand formations: and as, in another place, he describes this latter formation as subcretaceous, by which I understand him to mean secondary; he must be considered as implying, that the prairies themselves are to be classed amongst the secondary formations; other geologists who have examined them have generally agreed in placing them amongst the tertiary,—a circumstance with which he must have been acquainted:—we may therefore, without pretending to determine which of these opinions is the most correct, be permitted to express surprise, that he should have omitted to state the reasons, which induced him to differ from the general opinion. He cannot, I think, be highly complimented on the success of his attempts to solve the much disputed question of the origin of the prairies. He states (p. 77) that he is "not of the opinion of those who think that all prairies have originally been produced by firing the timber annually, and thus, by repeated combustions, destroying the timber as well as the sprouts," but I believe no one acquainted with the prairies, or with the general condition of the country when inhabited by the Aborigines, ever entertained such an opinion, for had such a cause operated to produce the destruction of the forests, we see no reason why all the lands belonging to the Indians, with whom this practice was universal, should not have been converted into prairies. It is surely unphilosophical to admit that a cause insufficient in itself to produce a given effect, can, as he supposes, become sufficient, merely because no other apparent cause can be assigned for its production. We must therefore conclude, that no prairie has originated from these annual firings. Agreeing with him thus in a great measure, that prairies have not been thus formed, we may proceed to examine his notions of the actual cause of their production. He enumerates (p. 77) "amongst the efficient causes of a prairie" that "where the vegetable matter is thin, and the season unfavourable, plants

are liable to perish; and where they would not perish altogether, it must be remembered that this country was stocked with buffalo, which would by their periodical occupation of the country, assist in exterminating plants of a vigorless constitution." This is a strange method of accounting for the production of a vegetable growth, perhaps the most vigorous and exuberant of any in the world. But he has "another view of the subject," which he introduces by a postulate, "that the vast prairies of the west, as well as the diminutive ones in question, must be admitted to be the ancient floors of the ocean;"—as it is known to every one, who is acquainted with the first rudiments of geology, that the secondary and tertiary formations are generally believed not only to have been all covered by an ocean, but actually formed beneath its waters, he will find no difficulty in gaining assent to this position. But let us see to what purpose he applies it, when he goes on to say, (p. 77) that "when it abandoned them, they were, of course, without plants; and unless we admit their spontaneous growth, we must suppose them to have germinated from seeds derived from plants growing on lands, which had been left with a higher level than the ocean, before it receded from these prairies. Their borders would, of course, be planted first, and thus we can conceive of every new generation of plants giving some of its seeds to the winds and the waters, and gradually extending the forests, like the present members of the human family, advancing upon and settling the country for the uses of posterity."

Even if we admit that nature extends the vegetable creation over newly formed lands by this slow and gradual process, which is altogether contrary to our experience, we do not find his argument much to the present purpose; for he seems to have abandoned the prairies altogether, and to have applied his reasoning, if such it can be called, to the formation of the *forest* only, and as this is all the information he affords us on the origin of prairies, he cannot be said to have added much to the stock of knowledge on the subject.

Mr. F. mentions, on the authority of a gentleman acquainted with the country, that "plants," I suppose he means trees, "are encroaching on the prairies generally;"—this is an universal belief, indeed it is notorious, that in Kentucky, where they formerly covered a great extent of country, they are now nearly obliterated. He assigns as a reason for this diminution of their extent, the disappearance of the buffalo from the settlements of man; for he has observed, he says, (p. 76) that plants "encroach on the sides where vegetable matter has been washed and accumulated, finding a nutritious bed there, into which they can push their innumerable delicate fibres, secured from the devastating teeth and hoofs of the buffalo, which have now all left this part of the country." I do not see that his argument is, under any circumstances, very conclusive: but neither herds of buffalo, or any other wild cattle, when they roam in unrestrained freedom over the vast extent of the prairies in this country, or the pampas and llanos of South America, ever remain long enough in one place to produce any permanent effect whatever, on any part of the vegetation. The most satisfactory reason I have seen adduced for the diminution or obliteration of prairie land, is, that as the population of the country increases, new settlers generally establish their residence on the borders of a prairie, and their domestic cattle, being accustomed to be folded and fed at night, usually pasture in that part of the prairie adjoining their homes, they by these means keep down the growth of the grass so effectually, that when other parts of the prairie are burnt, on these places there is not sufficient herbage to afford fuel for the flame, and consequently they escape the action of the fire; and as the continued trampling

of the cattle, on such spots, checks the luxuriant vegetation of the grass, the seeds of forest trees, which are profusely scattered over them, are enabled to germinate and throw up their shoots without danger of being choked in their infancy by the superior vigour of the prairie grass, as happens to them in those other parts, where this latter plant, reigns uncontrolled master of the plain.

Having thus followed our Geologist through his tour, we may now examine what benefits are likely to be derived from it, either to the general cause of science, or the particular interests of the country; and that he may not complain of injustice, I will give the words in which he himself (p. 91) "enumerates its most interesting results."

The first is, "the establishment of the fact, from personal observation, of there being, in the state of Missouri and the territory of Arkansas, an amount of the ores of lead and iron of an excellent quality, not only more than adequate to any estimate of the domestic consumption of this nation, but such as may justify the expectation that it will form an important element hereafter of commercial exportation from that part of the world."

Now as the fact of the existence of these mines has long been known and never doubted, he cannot be said to have established it; nor has he furnished any data by which the quantity or quality of their produce may be estimated; it is therefore difficult to discover the advantage likely to result from any thing he has said on this subject, for his observations on it are neither calculated to charm by their novelty, or to excite interest by their scientific accuracy.

Secondly and lastly, he says, (p. 94) "I consider it also as a result of great importance, that the extensive investigations which I have so recently made, have gone, without exception, to strengthen the opinion I submitted to the Geological Society of London in 1828, as to the series of rocks in the United States, being the natural equivalents of that observed in Europe, from whence we may infer that the causes which operated to bring the rocks there into the particular order of superposition they preserve, have operated here, and probably have acted upon the whole crust of the earth."

Mr. Featherstonhaugh may himself be gratified by any fancied corroboration of formerly expressed opinions; but we have no evidence in the report itself, that this result, which he deems of so much importance, has been attained; and even if it had, it would seem to have been altogether foreign to the object of his mission.

It is very apparent that throughout his tour, he has been continually torturing his imagination with the attempt to identify the rocks of this country with European formations, which he seems to consider as the types to which all others are to be referred; and he has directed his efforts to establish this theory, rather than to study the true character and give a correct description of our own rocks. That the primary rocks of all parts of the world have a great similarity of mineralogical character, and that their geological position exhibits less variety, than that of later formations will be readily acknowledged; for they have undoubtedly all originated from the same cause, and as might have been expected, identity of cause has produced similarity of effect: that those rocks, likewise, which are frequently termed "Transition rocks" differ but little from each other in the different hemispheres, is perhaps equally true. But as we ascend in the series, it is evident from the very mode of their formation, that the secondary and tertiary rocks, in regions distant from each other, have each taken their character from local and independent circumstances which have destroyed that identity of mineralogi-

cal and organic character, and that perfect uniformity in order of position, which he wishes to claim for them.

Probably in no two primary ranges do the rocks of which they are composed, occur in exactly the same proportion, and even those rocks, particularly the granites, are subject to a variation in the qualities and relative quantities of their constituent minerals. The strata, therefore, which are formed by their disintegration are likely to assume a difference of mineralogical character, and no exact resemblance is to be expected, except in those of the same family, by which I would be understood to mean, those which originate from the same primary range; and the more distant any two correspondent strata in different families are from the parent rock, the greater is the dissimilarity between them likely to become. It is most probable, likewise, that each of these primary ranges was elevated above the level of the waters at different periods of time, consequently the formation of the subordinate strata in different families could not be synchronous, and from this cause, as well as from difference of climate, and zoological station, the fossil remains of organized beings found in them, may also be expected to exhibit dissimilarity; it becomes, therefore, difficult to establish any system of equivalency between strata differing in so many particulars. When, in the same family of rocks, two are found, not immediately contiguous, but occupying similar places in the series, and, though differing in mineralogical character, identified by a similarity of their organic remains, they may, I conceive, be called equivalents, as having been deposited during the same period, and such I apprehend to be the sense in which that term is used by European writers. But when it is employed, as it is by Mr. F. throughout his report, to express a relation between strata in this country and those in Europe, it is productive of confusion and error, and, till the true nature and character of the formations of this continent are better understood, can lead to no satisfactory result. He has no where told us. what he understands by it himself, and he uses it in such a desultory way, that it is difficult to collect his meaning, if indeed he have any. For instance, (p. 59) he speaks of finding in Arkansas, a red sand, stone resting upou grauwacke slate, and says he satisfied himself "that he was upon the true equivalent of the old red sand-stone and grauwacke of English geologists;" now such a formation as that which he found may be identical in its mineralogical characters with the sandstone and grauwacke of England, but I do not see how he can call them equivalents. Again he says, (p. 41) "when we add to the list the lignites, and the equivalent quadrupedal and saurian remains found in both countries," and (p. 76) "I have found the greatest profusion of the fossil equivalents of the genera peculiar to the green-sands of Europe." If these last named fossils were *peculiar* to the green-sands of Europe, we may wonder how they got into Alabama; and, in general, we may enquire, how, under such circumstances, any fossil remains can be said to be equivalent to each other; for if they vary in character or species, there would seem to be no relation between them, and if they are of the same species they are alike or identical. In the same way, he refers on two or three occasions, to Mr. Lyell's Eocene period; as when he says. (p. 39) he "found it in various parts of the territory of Arkansas," and again, (p. 62) speaking of a deposit of marine shells, he designates it in a note, to be "of the Eocene period of Mr. Lyell." The very lucid and beautiful arrangement proposed by Mr. L. for determining the relative ages of the different tertiary deposits, will doubtless greatly facilitate the study of them in all parts of the world, and

remove much of the ambiguity which has hitherto attended the line of demarcation between them, and the secondary strata; and as Mr. Conrad has observed, "although the tertiary formations in this country do not exactly correspond with those of Europe, there can be no objection to use their terms to designate them, as they apply equally well here as there." It requires, however, a perfect knowledge of fossil conchology, and an intimate acquaintance with the molluscous animals now inhabiting the waters and land of this vast territory, together with great patience of investigation, to enable any one to make a correct application of this system. Now, I would not be supposed to insinuate a doubt of Mr. F.'s conchological knowledge, but, as he made so brief and cursory a visit to the country he is describing, he must be aware that some incredulity may be felt as to the correctness of these off-hand assertions; an explanation of the reasons which led him to such conclusion, would, therefore, have been more satisfactory to men of science, and more instructive to a great portion of the "all," to whose intelligence he professes a desire to make his report *transparent.*

I would likewise suggest, that his geological phraseology is somewhat loose and indeterminate; for instance, he makes repeated use of the term "carboniferous," as applied to limestone, and as, in the commencement of his work, he professes to follow the improved Wernerian classification, which separates the strata into primary, transition, secondary, and tertiary classes, and in which we find no mention of a carboniferous group, some explanation of the term, if he chose to employ it, would seem to have been desirable; for unless defined by the adoption of the classification of Philips or Delabeche, it is singularly inappropriate, since, strictly speaking, all limestone is carboniferous. The use of the word "subcretaceous" is still more objectionable, particularly in a country where chalk is altogether wanting; indeed, I do not know from whence he has taken it; Delabeche uses the term "supercretaceous," to express the tertiary formations, but "subcretaceous" is not found in his system, and it does not appear whether Mr. F. himself intends to apply it to all the secondary formations, which interpretation it would certainly bear, or only to the green-sand formation of the Atlantic States.

The truth of his theory, respecting the greater antiquity of this continent, when compared with that of Europe, as deduced from the absence of some of the secondary strata found in that section of the globe, must be considered as questionable, till it is proved that the tertiary are actually incumbent on the primary or transition rocks, which, I believe, has not yet been, in any case, ascertained; for if they are not, they must rest on the secondary, and the only conclusion to be drawn, from the greater proportional part of the surface they occupy in this country, would be, that at the period of their formation, a great portion of the secondary rocks had not been raised above the waters of the ocean.

With regard to his pertinacious adherence to the dogma of European geologists, relative to the invariableness of the "constant succession in the order of rocks, in respect to their superposition to each other," (p. 42) I would only remark, that a study of the transition rocks between Baltimore and Cumberland, and of the coal districts and secondary rocks of the valley of the Ohio, would, in my opinion, convert the most staunch believer in such a doctrine, from so erroneous a faith.

His suggestion of giving the more determinate name of "Atlantic Primary Chain" to the range of mountains which traverses this part of the western continent, is worthy of notice, for certainly much confusion and

misunderstanding prevail from the names now so indiscriminately given to its different parts. His advice to the governments of the different states, to use caution in the selection of the persons to whom they entrust geological surveys, is likewise judicious, of which perhaps, no more convincing proof is requisite, than the perusal of this report.

Authors are said to feel a parental affection for the fruits of their literary or scientific labours, and the parental στοργη is frequently stronger in proportion to the weakness or deformity of the offspring. Mr. Featherstonhaugh may, therefore, think I have treated his bantling with undue severity; but, as every citizen of this country is interested in vindicating its literary and scientific, as well as its political character, I cannot refrain from the remark, that if a work, such as this, can be presented to the National Legislature of the American people, and by it be ordered to be printed, and thus circulated with the stamp of its approbation through the world; if it is extolled with the most adulatory encomiums by a great portion of the newspaper press, and receives no castigation in the pages of those journals, whose peculiar province it is to be leaders and guides in matters of science, it is time for America to abandon all pretensions to rivalry with Europe on such subjects, and sink at once into that station of mental inferiority, which has been sometimes so contemptuously and so unjustly assigned to her, by a certain class of transatlantic writers. P.

Franklin Institute.

Annual Meeting.

The annual meeting of the Institute was held at their Hall, on Thursday evening, January 21st, 1836.

Thomas Fletcher, Vice President, in the Chair;

J. Henry Bulkley, Rec. Sec. P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books were received from Messrs. J. Henry Bulkley, Henry Troth, Edward H. Gill, Christopher Wesener, Carey, Lea, & Blanchard, James Harper, Abraham Miller, C. B. Trego, and William Maclure, of Philadelphia; Edward P. Roberts, of Baltimore, Md.; and the Mechanics' Institute, of Manchester, England.

Major Hartman Bache presented a chart of Charleston harbour.

Mr. L. V. Badger, of Portsmouth, N. H., presented a model of a hot air forge.

Specimens of minerals and ores were received from Messrs. Thomas Pearson, John C. Trautwine, Captain J. J. Wheeler, Samuel V. Merrick, Samuel Tyson, Edward H. Gill, and John C. Cresson.

The Corresponding Secretary laid on the tables the periodicals received during the past quarter, in exchange for the Journal of the Institute.

Isaac Hays, M. D., from the Board of Managers, read their twelfth annual report, which was accepted, and referred, for publication, to the Committee on Publications.

The Treasurer presented his report for the last quarter, which was read and accepted.

Prof. A. D. Bache, from the Committee on Science and the Arts, presented a report of the transactions of the Committee for the past year,

which was read, and, on motion, was accepted, and referred to the Committee on Publications.

Mr. John Horton, from the Committee of Tellers appointed to receive the votes of the members for officers and managers of the Institute, for the ensuing year, presented their report of the result of the election; when the Vice President declared the following gentlemen duly elected.

JAMES RONALDSON, President.

ISAIAH LUKENS, THOMAS FLETCHER, } Vice Presidents

JOHN C. TRAUTWINE, Rec. Sec.

ISAAC HAYS, M. D., Corr. Sec.

FREDERICK FRALEY, Treasurer.

Managers.

Samuel V. Merrick,	Joshua G. Harker,
Abraham Miller,	John Wiegand,
William H. Keating,	John Agnew,
Isaac B. Garrigues,	Wm. B. Reed,
Rufus Tyler,	Alexander M'Clurg,
John Struthers,	Joseph S. Walter, Jr.,
Matthias W. Baldwin,	Samuel Hufty,
Mordecai D. Lewis,	John C. Cresson,
Benjamin Reeves,	*James M. Linnard,
Alex. Dallas Bache,	*Andrew M. Eastwick,
Alexander Ferguson,	*Isaac P. Morris,
J. Henry Bulkley,	*Earl Shinn.

Prof. A. D. Bache, Chairman of the Committee on the Explosions of Steam Boilers, presented Part I of the report of the Committee. being the report of the experiments on the explosions of steam boilers, which, after reading the preface, was accepted.

Extract from the minutes.

THOMAS FLETCHER, *Vice President.*

J. HENRY BULKLEY, *Rec. Sec. P. T.*

Twelfth Annual Report of the Board of Managers of the Franklin Institute.

The Board of Managers, in surrendering to their constituents the powers with which they have been entrusted, have, as their last official act, the duty to perform, of laying before the society an account of its proceedings during the past year.

The great object for which the Institute was founded,—"the promotion of the mechanic arts,"—has been pursued with unabated zeal and assiduity. By means of lectures, schools, collections of models and minerals, a library, and a journal, information of the most valuable description has been disseminated to mechanics, and emulation among them excited, by premiums for the best productions of their workshops.

The Department of Instruction consists of a regular course of lectures on Chemistry, applied to the arts; one on Natural Philosophy, and occasional lectures on other sciences; a drawing school, and a school for elementary

* New members.

instruction of apprentices. The lectures are, as usual, well attended; they are especially devoted to the instruction of mechanics in such branches of science as are of practical application in the exercise of their trades, and the advantages derived from them are strongly felt, and generally acknowledged.

The drawing school, under the charge of Mr. William Mason, and Mr. John Maclure, is at present in the most prosperous condition. The number of students admitted this year was so large, (sixty-seven,) that the room formerly appropriated to the school was found too small, and more ample accommodations have been furnished.

The collections of models and minerals, though still small, are highly useful for reference, and their future enlargement should be an object of constant and strenuous exertion.

The library continues to increase, and already embraces 1500 volumes. Of these, 199 have been added during the past year; 48 volumes by donation, 81 by exchange for the Journal, and 70 volumes by purchase.

The Journal of the Institute continues to grow in public favour, though its circulation has not yet become so extensive as its merits ought to obtain for it. The extension, however, recently sanctioned by the Board, which will contribute much to its utility, will also, no doubt, obtain an increased patronage. By the extension alluded to, mechanics will be furnished with more of the elementary matter they have desired than heretofore, while those who are devoted to scientific pursuits, will receive a full account of the progress of science here and abroad. To enable the Editor and Committee on Publications to accomplish this, the size of the Journal page is enlarged, so that one-sixth more matter will be furnished to the subscribers, and this without any increased cost to them. The Institute, it is hoped, will be remunerated for additional expense, by the increase of patronage which this arrangement will obtain.

The Committee on Science and the Arts have continued their useful labours during the year, with unabated zeal. On this committee are to be found individuals of the various callings embraced in the arts, and inventors who submit subjects to them are sure of a thorough, practical, and scientific investigation. The award of the Scott's legacy premiums and medals being made by the managers on the recommendation of this committee, improvements in the arts submitted, are rewarded, when of standard merit, by this testimonial, in addition to a published report. For the details of the transactions of this committee, the Board refer to the report of the Chairman.

The report of the Committee of Premiums and Exhibitions, will furnish you the details of the exhibition of domestic manufactures, held in October last. It is sufficient here to state, that the display was in all respects gratifying, and creditable to the skill of our artisans.

The Committee on the Explosions of Steam Boilers have completed the most important part of the experiments, instituted at the request of the Secretary of the Treasury of the United States, and have drawn up a report of the same, which the Board has ordered to be transmitted to the Department, and a copy of which will be laid before the society this evening.

The Board have, on the part of the Institute, paid the first instalment of $15,000 to the masonic company; but this company not having been prepared to deliver up the premises, purchased by the Institute, at the period originally agreed upon, an arrangement has been made by which they are to retain possession until the 1st of March next, and allow to the Institute interest for the first instalment paid; and the payment of the second instalment, which was to have been made on the 1st instant, is post-

poned until possession of the property is given. An arrangement, under existing circumstances, advantageous to the Institute.

Two hundred and seventy-three members have been elected during the past year, sixty have resigned, and sixteen died; the number of members at present is 1921.

The funds of the Institute, as will be perceived by the Treasurer's report, which is annexed, are in a prosperous condition. The receipts for the past year were $9.960 26, and, after honourably and promptly meeting all claims, as made, there remains in the treasury, $3,065.13. The sinking fund amounts to $12,013 43.

The Board cannot close their report without congratulating the society upon their prosperous situation. The success which has hitherto attended their efforts, evinces the judiciousness with which they have been directed, and affords a stimulus for continued and increased exertions for the advancement of the great objects for which we have been associated.

ISAAC HAYS, *Chairman.*

WILLIAM HAMILTON, *Actuary.*

Annual Report of the Transactions of the Committee on Science and the Arts.

In pursuance of the directions of the Committee on Science and the Arts, I beg leave respectfully to present to the Institute, a report of the transactions of the Committee for the past year.

The Committee have examined, by sub-committees, during the past year, thirty-four subjects, or inventions, submitted to them, besides ten which were continued over from the preceding year. Of these, nineteen received favorable reports; six were judged worthy of the award of the Scott's legacy medal and premium; and three were withdrawn by those who presented them for examination, or the sub-committees discharged.

The premiums awarded from the Scott's legacy fund, during the past year, present a favorable view of the progress of some branches of practical science, which have hitherto not received contributions from our countrymen. Such was the award to Amasa Holcomb, of Southwick, Mass., for a method of mounting reflecting telescopes, combining the greatest simplicity with stability. To N. Bassett, of Wilmington, Del., for a compass for detecting and measuring local attraction. To W. A. Burt, of Michigan, for an ingenious apparatus for measuring the variation of the needle, to be used with the common compass, and remarkable for the facility with which it furnishes approximate results.

To Mr. Holcomb belongs the merit of having succeeded in making and polishing a speculum of eight inches aperture, which, when mounted in a front view telescope, gave highly satisfactory results. Double stars, 1.4″ and even 1.2″ apart, were divided by the telescope.

The mechanical inventions which received the award of a premium, were a shifting gauge cock, by Mr. Philos Tyler, of Philadelphia, and a knitting machine, by Messrs. M'Mullin and Hollins, of Sinking Valley, Pennsylvania. The former is a substitute for the common gauge cocks, the office of which it completely fulfils; it is simple in its construction, and very convenient. The knitting machine is necessarily complex, but performs its work very perfectly, and is well guarded against derangement.

The tinned lead pipes of Mr. Ewbank, which have received a similar award, will prove particularly valuable for water pipes, in situations where lead is corroded by the water passing through it. They are offered at a cost very little exceeding that of the ordinary lead pipes.

Although the rules in regard to the award of these premiums are handed to every inventor, who submits an invention to this Committee, and are published in the Journal of the Franklin Institute, some of the awards are yet imperfect, from the omission to present drawings, or models, of the inventions, as required by those rules.

Following out the principle to publish their reports, when the inventions submitted are brought before the public by patents, or otherwise, or when the publication is desired by the inventor, there have been published in the Journal of the Institute, during the past year, nineteen reports. There yet remain unpublished, but which have been ordered for publication, ten reports.

These proceedings show that the activity manifested by the Committee during the first year of its organization, has continued unabated during that just completed. The confidence of inventors in the counsel which it furnishes to them, seems, also, to have been undiminished. Thus, the design of the Franklin Institute, in the constitution of the Committee, is fully carried into effect.

The Committee have to regret the decease of one of their young and promising fellow members, Mr. J. Wilson Mitchell, deceased August 21st, 1835.

The number of the Committee is, at present, sixty-eight.

A. D. Bache, *Chairman.*

January, 1836.

Mechanics' Register.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN AUGUST, 1835.

With Remarks and Exemplifications by the Editor.

1. For a *Machine for Spreading a Solution of India Rubber upon Cloth;* William Atkinson, Lowell, Middlesex county, Massachusetts, August 15. (See specification.)

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2. For a *Saw Set;* Theodore Taylor, Port Deposit, Cecil county, Maryland, August 15.

The setting with this instrument is not to be performed by a blow, as is usually done, but by the action of a lever, the long and short arms of which stand in a direction nearly vertical, there being two bends in it, at right angles, near its lower end, where the fulcrum is placed. Its lower termination is in a triangular face, adapted to the form of the tooth of the saw, which tooth is pressed between it and a suitable anvil, or bed piece, furnished with adjustments, to adapt it to different saws.

"Now, what I claim as new, and as my invention, is the angular lever by which the force requisite to set the teeth of the saw is applied to the trian-

gular foot; the strap, with the thumb screw and stops; also, the form of the rest, operating in the manner, and for the purposes, herein set forth. I do not claim the bevilled anvil, and foot for setting saws, but only in combination with the parts above claimed."

We have not seen this saw-set in operation, but, so far as the evidence before us justifies an opinion, we think it likely to answer better than most of those which have been previously patented.

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3. For a *Churn;* Joseph Turner, Poland, Cumberland county, Maine, August 15.

This churn has a formidable array of levers, rods, and connecting joints, by which two dashers are to be worked up and down in an oblong square box; we do not think it worth the space which would be required to describe it, or to furnish the claim; the former would show a complex mode of effecting that which has been repeatedly, and as well, done by more simple means; and the latter a variety of mistakes in supposing old things to be new.

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4. For a *Machine for Shelling Corn;* Joseph Turner, Poland, Cumberland county, Maine, August 15.

A vertical wheel, set with pins upon its face, is to be made to revolve, and the shelling is to be effected between this wheel, and a follower borne up towards it by spiral springs. There is nothing in the particular arrangement of the follower, as claimed by the patentee, to render it better than the analogous contrivances which have been used in the machines with vertical wheels of cast-iron. The claim is to "the follower, as made in three distinct pieces, and the application of the spiral springs to the follower, together with the slide separating the cob from the corn." This latter claim, so far as we can understand it, is for a thing without any novelty; but as it is not represented in the drawing, and the latter has no written references whatever upon it, a little obscurity may be expected.

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5. For a machine for *Dipping and Cutting Candle Wick;* William Morey, Charleston, Worcester county, Massachusetts, August 15.

We cannot pretend to describe the construction or action of this machine, as neither the specification nor the drawing furnish the means for doing so. We do not believe that a whole college of competent workmen would be able, with their united intelligence, to construct the apparatus from the description which these supply.

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6. For a *Cartouch Box;* Robert Dingee, city of New York, August 15.

The flap of this cartouch box is to be fastened to the body by means of a long metallic hinge, instead of depending upon the leather covering alone, which, by exposure to the weather, is said to become very hard, difficult to open, and easily broken.

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7. For a machine for *Hulling Grass Seeds;* Samuel Gould, Jr., New Portland, Somerset county, Maine, August 15.

This machine is to rub the seed between a cylinder and two hollow segments, all covered with perforated sheet iron. The cylinder is not to turn round, but to vibrate backwards and forwards, each of the hollow segments

embracing a quadrant, or more, of its lower half. The segments stand at a sufficient distance at the upper edges, to feed the machine. The description is not full, and there is no claim.

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8. For a *Cooking Stove;* Solomon Dixon, Richmond, Wayne county, Indiana, August 15.

This stove is intended for wood, or coal; we do not see any thing in it entitling it to special notice, although we do not know of any other in precisely the same shape, or having exactly similar shifting, or moving, parts.

"The improvements which are new, and for which I claim a patent, are the slides, the valve, with the cuts, or openings, in the diagonal plate, and the passage for the heat and smoke caused by the cuts, and in the vacuum below, in the semicircular box."

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9. For a vertical *Cutting and Press Machine for Books and Paper;* Benjamin Morris, Oxford, Chenango county, New York, August 15.

The cutting part of this machine is very similar to that of those in general use, in which a long knife is brought down vertically to cut the edges of books, or paper. The following may give some idea of the points of novelty claimed by the patentee.

"I have thus shown the construction of my vertical cutting and press machine in all its principal parts, and, in so doing, have described many things which I do not claim as of my invention; but what I do claim is, first, the attaching the knife by which the cutting is to be effected, to a separate frame, as shown in the drawing, which separate frame, with the knife, may be removed from the sliding frame, and again affixed thereto by means of thumb screws and buttons, for the purpose of sharpening the knife, without altering the setting or adjustment thereof. I claim, secondly, the general combination and arrangement of the different parts of this machine, as described, for the purpose of moving the frame of the cutting knife, and also of the frame for pressing; not intending, however, by this claim, to confine myself to the precise arrangement which I have exhibited, but to vary this as I may think proper, whilst I attain the same end by means substantially similar.

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10. For a *Machine for Splitting Shoe Pegs;* Mark Wilder, Peterborough, Hillsborough county, New Hampshire, August 15.

A vertical frame has, at its lower end, a cutting knife for cutting the pegs, which knife is attached to a vertical slide, that is operated upon by a toggle joint, worked by a bar, or pitman, in the usual way. The blocks, after having been pointed by a grooving tool, are placed upon a sliding bed below the knife, where they are secured upon a metallic disk adapted to receive them. The sliding bed is made to advance by the action of a feed rod, which receives its motion from that of the toggle joint, and slide. The grooved block must, of course, be adjusted to the knife, and must also be surrounded by a strap, to keep the rived parts together.

The claim is, to "the toggle joint, lever, and knife shaft, the revolving disk, and appendages, together with the palls by which the feeding is effected, the whole operating in combination for the purposes, and in the manner, herein set forth and described."

The claiming of the toggle joint, palls, &c., separately, is not a safe

course, as they are not the invention of the patentee; yet, by a fair construction of the foregoing, they are claimed individually, as well as in combination.

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11. For an improvement in Hubbard's *Rotary Pump;* David M. Walker, Cavendish, Windsor county, Vermont, August 15.

This might as well have been called an improvement upon a dozen other rotary pumps, as upon Hubbard's. Like the rotary pumps which have preceded it, it is difficult to make, and of little worth after it is made, as its operation depends upon the fitting of revolving pieces of metal to the interior of a drum, or cylinder, in which they revolve. Had the patentee been acquainted with the history of rotary pumps, as they have been known for upwards of a century, he would not have placed this upon record.

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12. For *Making Potash;* Elijah Williams, Harbour Creek, Erie county, Pennsylvania, August 15. (See specification.)

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13. For *Ships, constructed wholly of Iron;* Charles Olcott, Medina, Medina county, Ohio, August 15.

The only thing proposed to be changed is the material of which ships are constructed, as "no alteration is made in the *exterior shape*, or model, of vessels. The relative proportions of the hulls, masts, spars, and other parts of vessels, are to be the same, or nearly the same, in ships built on this plan, as before." In the claim, the patentee confines himself to the forms of the various individual parts, furnished with flanches, &c., for putting them together, "all exactly in the *manner* and of the *materials* above described."

The patentee states that the invention was made by him in the year 1815, although circumstances have caused him to delay the taking of a patent until the present time.

Steamboats, and various masted vessels, have, many years since, been made of iron. Masts for ships, also, have been constructed of the same material, and the question of adopting it in the building of sea vessels generally, has been a subject much discussed. Who first suggested the idea, we cannot tell, and it is likely that the thing is not known; but we are certain that it could be traced back beyond the year 1815. The mere building of ships of iron is not now, therefore, a legitimate subject for a patent, as the proposition is not new to the public. The exact construction, or form, of the individual parts, as described and claimed by Mr. Olcott, if new, is his; but this, without a claim to the system, will be of little value, and such a claim would, manifestly, be invalid.

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14. For a *Washing Machine;* Calvin H. Farnum, Norwich, New London county, Connecticut, August 15.

A cylinder is to revolve within a box, in the manner of the common dash wheels; the periphery of this cylinder is to consist of slats set in the manner of the buckets of a water wheel, in order that they may cause the suds in the box to pass forcibly into the cylinder. The box is to be enclosed, to keep in the steam; the lid at the top is to be of zinc, brass, or copper, an the gudgeons, and other metallic parts, are also to be of one of these substances, instead of iron.

"The invention claimed, is the improvement made in the above described

machine, by the use of a metallic top and lid; and the confinement and application of the steam; and the use of zinc, copper, or brass, gudgeons and boxes, and the arrangement of the floats of the wheel."

The metallic covering is injurious, defeating, by its conducting power, the very object for which it is professedly adapted; well fitted and arranged coverings and doors of wood are to be preferred. The substitution of the metals named for gudgeons and boxes, to avoid the danger from oxide of iron, is a thing well known; the form of the floats may probably be advantageous.

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15. For a *Machine for Sawing Shingles;* David B. Moore, Gilmanton, Strafford county, New Hampshire, August 15.

In this shingle machine, the sawing is to be effected by a circular saw. The bolt, or block, from which the shingles are to be sawed, is confined on a carriage by proper hold-fasts. A shifting motion is described, by which the thick and the thin ends of the shingle are alternated. Many of the parts are much like those used in other shingle machines, and the claims, therefore, are limited to the particular modes of construction devised and described by the patentee.

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16. For a *Machine for Making Bricks;* George W. Gilbert, Pittsburgh, Allegheny county, Pennsylvania, August 15.

The machine here patented is accompanied by a drawing, sufficiently well executed, so far as it goes; and it might probably be found sufficient for its purpose, if the specification were such as to fulfil its share of the business of description; this, however, is altogether defective, containing little more than a mere catalogue of the respective parts. It ends with a claim to "the arrangement and adaptation of the several parts of the before described machine for making bricks, particularly the wheel of moulds, the pistons, guides, pin, and lever, and the spiral cam for moving the wheel of moulds."

The *wheel of moulds*, which is *particularly* claimed, is not new, and the individual things enumerated may be important as making parts of a combination, but, taken by themselves, they are trifling, and not fit subjects of a claim.

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17. For *Bricks for Fire Proof Roofs;* James Parker, Gardiner, Kennebec county, Maine, August 15.

These bricks are rhomboidal at their ends, so that when their flat sides are placed horizontally, their edges will have the same inclination with the intended roof. This comprises all the information necessary respecting their shape. To form a roof they are to be laid on laths, or on smooth boards, as may be preferred, when they will present a smooth and even surface. The claim is to "the peculiar form of the bricks, and of the mould in which they are to be made; and the application of bricks to the purpose, in the manner described."

Without animadverting upon the claim, we will observe that the use of tiles is objectionable on account of their great weight, which renders it necessary to frame the roof, and to build the walls with corresponding strength. How it may be with the houses in Maine we know not, but in most parts of the union the roofs and walls would not sustain the load which it is here proposed to put upon them, and to enable them to do so would cost more than metal roofs, which are incontestibly superior in all respects to those of brick.

18. For a *Press for Cotton, Hay. &c.;* Ebenezer Macomber, and Laban S. Macomber, Gardiner, Kennebec county, Maine, August 15.

This press is peculiar in the mode in which it is acted upon, which is by levers applied by hand to teeth on a vertical piston, or shaft, on the top of which is the follower. The main lever used for the purpose must correspond in length and in stoutness, to the power with which it is to act. Upon the bottom, or platform, of the press there are boxes of cast-iron which have ridges upon them serving as fulcra to sustain the lever; these fulcra are movable, so that the power applied may vary with the resistance. The distance gained by raising the piston is retained by wedges which slide forward by the action of a weight, passing over a pulley. The whole appears to be skilfully arranged, and we have been informed that in packing cotton it has performed considerably more work with the same power than any of the presses known in the neighbourhood of the place where it was erected; an effect which appears to be due, principally, to the little friction to which it is subjected.

We do not give the claims, as they refer not only to the general arrangement, but also to certain particular parts which we cannot take time to describe.

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19. For *Machinery to facilitate Evaporation;* John Goulding, of Boston, and Reuben Brackett, of Lynn, Massachusetts, August 15.

This patent is obtained for "machinery for facilitating the evaporation of solvents, or fluids, and in various water proof compositions or mixtures, from the cloth or other substance to which said mixtures or compositions may be applied, and also for condensing the same again, or converting them from an aeriform into a liquid state."

The cloth coated with a solution of India rubber is to be wound upon a roll in such a manner as to allow it to form a spiral with a space between each coil. The reel and the cloth so wound on it is then to be enclosed in a box, or case, of wood or of metal, fitting together so perfectly as to prevent the entrance or the escape of air. From the top of this case, or box, there is a tube leading to a condensing apparatus of any convenient form. Heated air, or steam, is to be admitted into the case, either through the axis of the reel, if made hollow for that purpose, or through any other convenient opening, the effect of which will be to evaporate the volatile solvent. The claim is to the accomplishing this object, and to the collecting of the solvents by the means described.

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20. For a *Stove for heating Tailors' and Hatters' Irons;* John Lewis, Derby, New Haven county, Connecticut, August 17.

A cast-iron furnace is to be made to contain anthracite, and under this there is to be an ash pit. Around the furnace, or "chamber of combustion, are placed several linings of sheet-iron, about an inch apart, forming air-tight chambers enclosing columns of *fixed air* (?) to prevent the lateral escape of the heat." There is to be a cover to the stove, which is to be an "air-tight chamber formed by several linings of sheet-iron or tin, enclosing columns of *fixed air*, to prevent the escape of the heat into the room." The claim is to "the application of fixed air chambers around a stove for the purpose of heating tailors' and hatters' irons; at the same time preventing the heated air being transmitted into the apartment in which the stove is placed in the manner before described.

By *fixed air*, we suppose is meant air fixed within the chambers. The

apparatus itself, we apprehend, will be more costly than a small brick furnace built for the purpose, without being more convenient.

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21. For the application of *Water Lime Cement to the Construction of Roads;* Joseph Roby, Jr., Albany, New York, August 27.

The whole system contained in this specification is that so well known of forming roads by the employment of hydraulic lime with beds of gravel, or broken stones of a suitable quality; the directions given do not contain any thing with which engineers are not familiar, and the patentee tells us, in conclusion, that "he would add to his specification and claim, the right to construct roads, streets, &c., by the use of water lime or cement, in any other manner than above described," a right which will be very readily conceeded to him, provided it be not an exclusive one; to this both the ancients and the moderns may well demur. Our shelves would furnish a volume of evidence of the antiquity of such roads; we have opened the "*Dictionnaire Technologique*" only at the article "Cement," and give the following note: "I have very recently had occasion to examine a piece of natural hydraulic lime, from which a hydraulic mortar of great excellence is prepared, and which is principally employed in the construction of cement pavements of very great solidity."

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22. For a *Churn;* Caleb Angerine, City of New York, August 17.

Mr. Angerine obtained a patent for a churn some time ago, and although he has a new patent he has not a new churn, as this last is a fac simile of such as were previously on the shelves of the patent office. Two churns of the ordinary kind are placed upon a platform, the two dashers are attached to a vibrating beam, to which motion is communicated by a crank, aided by a fly wheel. The patentee claims "the application of the *walking beam, fly wheel, pendulous lever, operating crank and pitman,* in giving motion to one or more churns at once.

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23. For a *Harpoon;* Dexter N. Chamberlain, Boston, Massachusetts, August 17.

The patentee says, "What I claim as my invention is the introduction of prussic or hydrocyanic acid into a harpoon, for the purpose of destroying whales or other fish, or animals usually taken by that instrument, and furthermore I claim the construction of a harpoon as I have herein above described."

We do not dispute the fact of the patentee being the inventor of the use of prussic acid for the purpose designated, but if he was, he has been unfortunately dilatory in applying for a patent, as two or three years have elapsed since we were in correspondence with other individuals upon the same subject, and the taking of a patent was then declined because it was found that the idea was not new. The public papers have noticed it, long since, and it can scarcely, therefore, be called *new,* at the present day.

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24. For a *Wire Door Spring;* John Codman, Boston, Massachusetts, August 17.

The spring is called "the vertical tortine, wire door spring," and a patent was obtained for it on the 10th of December, 1832. The regulating box and wheel described in the former patent have been improved, and this forms the subject of the present application; a semicircular groove is to be made in the

box and wheel, the object of which we cannot take time and space to describe.

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25. For the *Application of the Waste Heat from Forges, Furnaces, &c.;* Tunis Leroy, Newport, Herkimer county, New York, August 17.

A steam boiler is to be so placed as to receive a due portion of the waste heat of forges, furnaces, &c., by which means a power is to be obtained which is applicable to various useful purposes. The doing this is the thing claimed. Owing to the great increase in the number of patents, we do not so frequently as formerly, turn to day and date to show when, and how often, patentees have been anticipated in their inventions. Our own patent office, and the establishments in foreign countries, might both be appealed to in proof that the foregoing possesses no claim whatever to novelty.

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26. For an improvement in *Power, and other, Looms;* Amasa Stone, of Rhode Island, but now residing in England, August 17.

In the specification of this patent particular reference is made to one formerly obtained by Mr. Stone, and dated the 13th of April, 1829, and upon which the present plan is to be considered as an improvement. After explaining the construction of his apparatus, by reference to drawings, the patentee says that, "having now described my improvement in power looms, and other looms for weaving silk, linen, cotton, woollen, and other cloths, called a taking up motion, together with the arrangement of parts by which the same may be carried into effect, I do hereby declare that I consider my claim of improvement or invention to consist in and extend to the connection of the reel with the cloth beam (in those looms where my former improvement already referred to is applied) and in the communication of motion from one to the other, and in the regulation of the motion of the cloth beam by the motion of the reed, by whatever combination of machinery, apparatus, or gearing, the same may be effected."

The object in view, and the general means of attaining it, appear to be similar to those of Mr. Burr, in the patent numbered 31, for the last month, (July.)

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27. For *Gates for Canal Locks;* David Wilkinson, Cohoes, Albany county, New York, August 17.

There is a good general drawing of the apparatus patented, but the description and claim lend little or no aid in making known the views of the patentee. The latter is as follows:

"The invention claimed consists in the before described mode of adjusting the friction roller, for the quadrant, or circular rail ways; the rider to guide the chain on the capstan; the open head with palls of the capstan, and the self-adjusting valve gate."

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28. For *Winding Silk from the Cocoons, without Reeling;* Gamaliel Gay, Poughkeepsie, Dutchess county, New York, August 17.

The particular construction of this machine is shown in a drawing which accompanies, and is referred to in, the specification. The claim is to "the winding of silk from the cocoons directly on to the spools, without the intermediate process of reeling; and also to that arrangement of the winding machinery by which the same is, or may be, effected, acting substantially as set forth."

29. For a *Mowing Machine;* John P. Chandler, Wilton, Kennebec county, Maine, August 17.

The frame work of this machine runs upon four wheels, three of which turn freely on their axles in the usual way, but one of the hind wheels is employed to give motion to the mowing apparatus, by means of a wheel and band. The scythes, four in number, are attached to the periphery of a wheel which revolves horizontally below the body of the carriage. In this specification there is nothing in the form of a claim; the general principle is not new, nor does the arrangement of the parts of the machine offer any thing to bespeak a more favourable opinion of its operation than of that of several others of the kind which have had a brief existence, and then passed into oblivion.

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30. For a *Spiral Band Wheel;* Samuel S. Walley, Charlestown township, Chester county, Pennsylvania, August 17.

The title of this patent led us to suppose that a band twisted spirally was to be employed upon a wheel; but as in books, so in patents, the title and the contents have sometimes but little connexion with each other. The patentee has conceived a notion that he can obtain a great increase of power by passing a band over polygonal or angular wheels; and we have a notion that if he ever attempts to use a band in the manner described by him, his example will not have a single follower. A description of the affair is out of the question; we must omit that and pass to the claim, which is to "the above described combination and structure of machinery applied so as to produce an increased power or effect from the increased adhesion of the band by its coiling one or more times upon an angular conical cylinder, or wheel, adapted for the purpose as aforesaid; and by the employment of a square hole with rollers, as a means of transmitting the band, and communicating circular motion from a perpendicular to a horizontal wheel, and vice versa, without the intervention of intermediate wheels as aforesaid."

If the reader does not understand the whole from the foregoing, it would be of little use to present the entire specification and drawing, as these would involve him in inextricable darkness.

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31. For a *Machine for Breaking Anthracite Coal;* Jonathan S. Hubbell, city of New York, August 17.

This is a machine to effect that which we are very apprehensive must continue to be done by hand. The coal is put into a kind of trough, the bottom of which is formed of iron bars, or grating; and hammers, or beaters, are made to rise by a revolving shaft, and to strike upon it. It is proposed to place an inclined screen below the trough to divide the coal, and we believe that this will be a very useful appendage, as we have no doubt that a large portion of it will be well pulverized, and that the remainder will be very unequally broken.

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32. For *Grinding and Chopping Grain;* Pierson Cope, Washington township, Fayette county, Pennsylvania, August 17.

This is merely a mill with a conical nut and box, the axis of which is placed horizontally, the feeding being effected through an opening in the shell at the small end. The claim is to "the plan of the castings; the plan of the furrows that they may grind fast with little power, and discharge freely through the opposite end, and the plan of tempering screws with the iron

slides, and putting it together for convenience;" each of which plans has about an equal claim to novelty.

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33. For a *Pocket Pistol;* Victor M. Wallace, West Topham, Orange county, Virginia, August 17.

The object of this invention is "to give the greatest length possible to the barrel of the pistol, for the purpose of discharging the ball with increased velocity and greater precision in its direction, as well as to a greater distance." To effect this object the back end of the barrel is cylindrical, and is passed into the stock, reaching to its end, the part grasped by the hand descending nearly at right angles from the upper portion. The percussion cap passes on to a nipple at the centre behind the barrel, the trigger operating upon it through the intermedium of a main spring and other appendages, contained within the handle of the stock.

The claim "is not to the discharge from the centre of the breech-pin, but simply to the manner of construction described, namely, the rounded back part of the barrel, with the manner in which I insert the breech pin, for the purpose of drawing the shoulders of both towards each other; also the disposition of the lock, as contained in the lower part of the grasp of the stock, also the interior of the trigger, and its adjustment as described."

There is some sacrifice made by rounding the back part of the barrel, as the breech is thereby rendered smaller than the outer, or muzzle, end; perhaps, however, means may be found to remedy this defect.

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34. For a *Cooking Stove;* Ezekial Gore, Jr., Guilford, Windham county, Vermont, August 17.

Here is a rectangular box which is divided into three compartments; the two end ones are ovens with doors, the middle contains the furnace, the upper end of which extends through the top of the box, where it is fed with fuel, and through which passes a tube leading into two boilers which stand on either end of the box, above the ovens. We do not think it worth while to give the claims as the thing is old in nearly every part; it is not long since a patent was granted for a stove nearly identical with this even in its minutia.

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35. For the *Application of the rising and falling of the tide to the propelling of Machinery;* Henry B. Fernald, Portsmouth, Cumberland county, Maine, August 17.

"A buoy of sufficient strength and dimensions, connected by a rope or chain passing from the buoy under a pully at the bottom of the water, with a wheel which moves the machinery. In the falling of the tide, or water, the weight of the buoy, filled with water by means of a stop cock, or otherwise, operates as a propelling power, being so connected by another rope or chain to another wheel, as to operate alternately with the wheel above-mentioned."

"What I specifically claim as my invention or discovery is the principle of applying the rising and falling of the tide, and other water, to the propelling machinery."

At p. 154, vol. 5, there is the specification of a patent granted on the 23d of December, 1829, to Henry M. Webster for a "tide power," in which it is said that "the object which the subscriber proposes to effect is to bring into value and use the rise and fall of the tide on the seaboard, and particularly

in the principal cities of the Union, to be employed in manufacturing and other purposes."

The two plans, it will be seen, are identical; in the first patent it is proposed to use "vessels or floats of great weight and buoyancy," "a condemned or other hulk of a ship of required size," being mentioned as suitable for the purpose. Some remarks of the editor will be found appended to the specification alluded to.

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36. For a *Lady's Saddle Tree;* John M. Bouton, Newark, New Jersey, August 17.

All the information given in the specification is that there is to be "a safety guard or rail extending from the head of the cantle, made from steel, iron, wood, or any other material, and secured at the two ends to the saddle tree by loops, sockets, rivets, nails or screws. The safety guard runs from the head to the cantle in a circular form, and is especially useful in securing the seat of the rider, and making them sit firmer and more safe."

Although this specification appears to be the work of a gentleman of the law, its requirements have been either misunderstood or overlooked, as the foregoing, most certainly does not distinguish the invention from all other things before known or used, nor set it forth in those full clear and exact terms which will enable a competent workman to make the thing intended to be described.

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37. For a mode of *Fitting the boxes for gudgeons into the plummer blocks; and also the bearing of the slides for Locomotive and other Steam Engines, and for other purposes;* Matthias W. Baldwin, city of Philadelphia, August 17. (See Specification.)

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38. For *Preparing of the Oil of Harze*; Christopher Preswick, and John M. Fisher, city of New York.

"The object of our invention is to prepare an essential oil from the condensible matter, or overflow, which is obtained in the manufacture of carburetted hydrogen gas, from resin-wood, or bituminous coal, or a mixture of them, and the said oil may be applied to the following purposes; that is to say, in the preparation of paints, varnishes and laquers, also as a solvent caoutchouc (or gum elastic); also for furnishing light in lamps." The condensible matter is to be mixed with animal or vegetable charcoal, and then submitted to distillation, the volatile oil being condensed. The claim made is to the effecting this object, in the manner proposed.

The tar, or condensible matter collected in making carburetted hydrogen from pit-coal is regularly submitted to distillation in England, and the essential oil, a species of naphtha, obtained from it is employed in dissolving caoutchouc, and for other purposes; yet this, according to the terms of the foregoing patent, appears to be one of the objects which the patentees claim as their own invention.

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32. For a *Machine for Sowing Plaster, Lime and Ashes;* Julius Notch, Great Bend, Susquehanna county, Pennsylvania, August 17.

A long trough, or box, divided into separate compartments, resembling so many small hoppers placed in a line with each other, is to be mounted on wheels, and to be drawn forward in the manner of a cart. The sides of these troughlike hoppers are inclined towards each other as they approach the

bottom, where they are only an inch or two apart; a rod extends from end to end of the opening, and partially closes it. The material to be scattered is put into the trough, or hoppers, and a longitudinal, vibrating motion is communicated to the above named rod, which has teeth, or pins, on it, to agitate the plaster, &c., and cause it to be scattered. The machine is badly described, and the claims made confine the patentee to the particular mode represented of effecting his object; they are to "the arrangement and adaptation of the crank, crank-rod, elbow, and horizontal rod, arm, and sliding rod, with its teeth, together with the regulating gauges, as described." It would require but little mechanical skill to construct a machine to answer all the purposes of the foregoing parts without using either of them "as described."

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40. For an improvement in the art of *Making Brushes;* Wm. Steel, city of New York, Aug. 17.

The stocks are to be prepared as usual for set, or drawn, work, and the setting, or drawing, is to be effected in the usual way; the difference between them and other brushes consisting in the substitution of feathers for bristles. The feathers are sometimes to be used by doubling them in the middle, so that the quill, as well as the feather end may project out; the quill end, if desired, may be split, or divided into several ends. In other cases the quill ends are to be inserted within the stock. "This applicant claiming the exclusive right to the mode of constructing brushes of feathers, for the following uses, viz: for dusting brushes of all kinds, hearth brushes, water brushes, and hair brushes of all kinds. This applicant contemplating the application of the principle of this improvement to the construction of all kinds of brushes which may be made of feathers instead of bristles."

The title of this patent is incorrect, as the improvement is not in the *art* of making brushes, but in the employment of a new material; it is therefore, properly, a new manufacture.

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41. For an improvement in the *Screw Wrench;* Solyman Merrick, Springfield, Hampden county, Massachusetts, August 17.

In this screw wrench the sliding jaw is not drawn back by turning the handle, as is usually the case with those imported, but the bar which is at the back, and makes a part of the sliding jaw, is acted upon by a nut which swivels in it, and turns upon a double threaded screw, extending from the oblong square part upon which the sliding jaw moves, to the handle, which is of wood. The nut is made octagonal, and is easily turned by the thumb and finger. The claim is limited to the arrangement of the screw and nut, which we believe to be new.

These articles are manufactured by N. Foot & Co., Springfield, Massachusetts; we have seen them, and can aver that in point of construction and of workmanship, one of them is worth several of the best imported wrenches.

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42. For a *Vapour Bath;* Pierre Paul Nöel D'Alvigny, city of New York. An alien, who has resided two years in the United States; August 17.

We have here a long story about the construction and use of this vapour bath, after perusing which, we are no wiser than we were before we commenced the task, the whole system adopted, being such as is well known, both in this country, and in Europe. The patentee claims "the manner in

which he has combined and arranged the several parts described," which, with the exception of such variations as would be made by any two persons forming a similar establishment, presents, as we have said, nothing new.

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43. For an improvement in the *Saw Mill Saw;* Levi Fisk, Schroon, Essex county, New York, August 17.

Every third tooth of a saw mill saw is to be sharpened to a cutting edge on its upper side, the teeth so sharpened being alternately on reverse sides of the saw; these teeth are then to be so set as to cause them to take a thin shaving off in their ascent, and thus to plane the sawed stuff, or to render it much smoother than is done by the common saw. It is said that experience has shown that the best effect is produced by so sharpening every third tooth, although an adherence to this number is not absolutely necessary. The claim is, to "the *upper oblique* edge of saw teeth being cut to the right and left alternately, and set together, or betwixt any number of common teeth, for the *upward* motion of the saw, for the purpose of sawing wood in a smooth manner, as above described."

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44. For a *Churn;* Clifton C. Stearns, Bucksport, Hancock county, Maine, August 17.

This churn is to have a vertical shaft, to which a revolving motion may be given, by means of a winch and bevil gearing. The dashers which project from the shaft, are to stand at an angle of about 45° with it, which, it is said, will give a tendency to the butter, as it is formed, to accumulate about the centre, thereby improving it, and causing the churn to work with the greater ease. The claim is to "the plan, or principle, of giving the dashers an oblique position, by which the butter, when formed, is thrown or accumulated in the centre of the churn."

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45. For a *Pendulum Level;* Asahel Munger, Oberlin, Lorain county, Ohio, August 17.

"This improvement consists, principally and especially, in attaching a tube, or a straight bar, with a sight at each end, to the top of a pendulum, in such a manner as to admit of its being arranged or adjusted, either by screws, or otherwise, at right angles with the pendulum, and may be suspended within an enclosure of any kind, which shall protect it from the influence of currents of air."

We have been in the habit of supposing that those persons who use levels, sometimes read books on the subject of surveying, engineering, &c.; but we find that this must not always be assumed. The pendulum level has been mentioned and exhibited in a thousand books, in all the languages of civilized nations. It is to be seen, with the pendulum enclosed, in *Leupold's Theatrum Machinarum*, in plate 3, vol. iii., published in 1724; how long it had been then known, we have not taken the trouble to ascertain. Its merits, or rather its demerits, have been a matter of frequent discussion.

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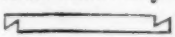
46. For a machine for *Planing and Matching Boards;* Fisher Stedman, Acquackanockin, Essex county, New Jersey, August 17.

The specification of this patent is equally laboured and obscure, yet it is manifest that the writer has desired to make it plain. It seems as though the model had been depended upon to make the machine known, as the drawing, although on three sheets of paper, can scarcely be said to illustrate

any thing. Toothed wheels, revolving cutters, saws, &c., &c., are all represented by simple lines, so that the man who should attempt to make the machine, must invent it in all its details. We learn, however, after much labour, that boards are to be planed by a round horizontal cutter wheel, under one side of which they are to be passed, by the aid of pressing rollers. The matching is to be by a dovetailed joint formed by horizontal cutters, which take away half the stuff on opposite sides towards each edge, thus,  if we understand the thing correctly. The claim is to "the whole apparatus and combination of machinery by which the board is traversed by the cutters in dressing the surface, and by which the edges are matched in the dovetail form, as described above, and is the invention for which a patent is now prayed."

The first part of this claim is altogether untenable, the dressing of boards by traversing cutters, in the way described, having been practised in numerous instances. Dovetail cutters were used at the navy yard in Washington, sixteen or eighteen years ago, for matching wharf timbers, and they were not then new; still, in the combination with the other machinery, had that not been altogether old, it possibly might have been sustained.

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47. For an improvement in the *Manufacturing of Chairs;* Eli F. Benjamin, Utica, Oneida county, New York, August 17.

A machine is employed for the purpose of boring the different parts of the chair which are to be connected together, as all the chairs made upon the plan of the patentee are to be put together by dowells. The machine has a shifting top, upon which the pieces to be bored are secured by proper means, the movements of the top admitting of giving the proper rake in all directions; there are, attached to the frame, two spindles, running like lathe spindles, to receive the bits to be used. The claim is to "the putting chairs together by or with dowells, and the described form of machinery for expediting every part of the work."

The model is referred to throughout the specification, which is a very gross error, though by no means an uncommon one. A drawing is given, but it does not furnish the details of the "described form of machinery;" to an ingenious workman, this, it is true, would be a thing of little consequence, as he could easily construct the required apparatus without trenching upon the claims of the patentee.

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48. For a *Rarefied Air and Rotary Motion Steam Engine;* George Cameron, Washington city, August 17.

This is one of the oldest and worst species of engines ever made, as its power is to be derived from blowing the steam on to the buckets of a wheel. Much stress is laid upon the using of a forked pipe, leading to opposite sides of the wheel, and furnished with stop cocks, to reverse the motion. The rarefied air part consists of a similar wheel, on to which the rarefied air from the furnace chimney is to be directed. We would propose as a motto for this, "*de pis en pis.*"

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49. For *Preparing and Hatcheling Hemp, Flax, &c.;* John Goulding, Boston, Massachusetts, August 19.

In this machine, the hemp is to be laid in a trough, in small handsful, and carried forward by a feeding apron, between feeding rollers, which deliver it on to a large hatcheling cylinder, set with suitable teeth, between which

it is pressed, so as to lie closely on the cylinder, by means of a reel-like roller, the longitudinal wires of which mash between the wire teeth. After passing under this cylinder, the hemp is raised, by a contrivance for that purpose, upon a second cylinder, revolving about seventeen times more rapidly than the former, and, of course, drawing out the fibres. From this second cylinder, it passes through a trumpet-mouthed tube, between rollers, and into a can. The slivers from ten, or any other convenient number, of such cans, may afterwards be passed together through the same circuit, and this may be repeated as often as may be thought necessary.

The claim is to "the above described mode of hatcheling hemp, flax, tow, or Manilla grass, and producing thereby a continuous strand, or sliver." We think that this claim is in terms too general, unless it can be made to appear that the machine is new in all its arrangements, as applied to the purpose for which it is to be used.

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50. For an improvement in the *Endless Chain Horse Power;* Benjamin Wales, Hallowell, Kennebec county, Maine, August 17.

The main dependence for sustaining the slats of this horse power, is the construction of the links, or hinges, by which they are connected together; various forms of the stop hinge joints, or self-supporting arches, have been devised for the same purpose, but they are all insecure, depending too much upon the strength of each individual joint. The patentee claims, "the modes of forming the hinge, and the peculiar form of the link; the forming of the end wheels with lips and projections; the mode of communicating power by the projections of the chain fitting into the indentations between the projections of the wheels; and the mode of sustaining the chain, and keeping it in its place by means of the railway and small wheels, as described." The novelty of some of these things is more than doubtful.

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51. For *Medicine for Cholera;* Robert S. Bernard, Norfolk, Norfolk county, Virginia, August 17.

Take

Sulphate Alumine, . .	2 grains.
Sup. Carb. Potassa, . . .	1 "
Alcohol, 80° above proof, .	40 drops.
Gum. Camphor, . . .	20 grains.
Hoffman's Anodyne Elixir, .	½ oz.
Compound tinct. Opium, . .	½ oz.
Sp. Lavender, . . .	1 oz.
Pure water, ...	3 oz.

A table-spoonful of the mixture in as much water, to be taken every hour, or half hour. For children, in proportion.

This is to cure Asiatic Cholera, Cholera Morbus, and Diarrhœa.

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52. For a *Cooking Stove;* Edward N. Kent, Portland, Cumberland county, Maine, August 17.

The patentee finds much in this stove to commend, and we have no doubt that a good dinner may be as well cooked by it, as by many others; there is not enough of novelty in it, however, to render any particular description necessary; the claims are, to "the damper for dividing the draught each way, and its rack; the *form* in which the stove is made to cook so many different ways, with less fuel and trouble than is caused in other stoves, I do not

claim." Less could scarcely have been claimed, but still we believe it will be found that even this little is more than is really new; dampers, or valves, having been used in various ways, to divide the draft, and to direct it over, under, or around, an oven, much in the way described in the present instance.

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53. For *Covering Houses with Sheet Tin, &c.;* Charles Bonnycastle, Charlottesville, Albemarle county, Virginia, August 17.

This patent is taken for improvements on the plan for which a patent was obtained by the same gentleman, on the 29th of June, 1833. The object aimed at is a simple and easy mode of fixing the roofing of buildings, so as to allow a free play to the expansion and contraction for which it is subjected, both longitudinally and laterally. The particular way in which this is effected, would require a cut for its explanation.

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54. For *Destroying Weevils, and other Insects, and their Eggs, in Grain; to Expel Moisture from Grain, Meal, and Manufactured Flour, and for Drying Malt;* James A. Lee, Maysville, Mason county, Kentucky, administrator of James Lee, deceased, August 17. (See specification.)

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55. For a *Machine for Serving Ropes, or Rigging;* James Fales, New Bedford, Bristol county, Massachusetts, August 20.

A perpendicular frame is made capable of traveling upon rollers, and at a convenient height from the floor; upon this frame there is a cog wheel with a tubular shaft, which wheel is so made that a portion of its rim, say one-fourth, or one-third, may be removed, for the purpose of admitting and removing the rope to be served, and again firmly fixed in its place. A rack, containing a reel for the serving yarn, is placed behind the wheel and hollow axles. In using this machine, the rope, after being passed through the tube, is stretched *taut;* the yarn, by the aid of a serving mallet, is passed around the rope in the usual way, and motion being then given to the wheel, by proper gearing, the serving is expeditiously performed. The claim is to "the above described combination of machinery, and its application to the purpose of serving ropes, or rigging."

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56. For an improvement in the *Grist Mill;* Adna L. Norcross, Hallowell, Kennebec county, Maine, August 20.

There may be an improvement here, but in what it consists we do not know, as the drawing, which is referred to, is a very poor affair. We learn, however, that the runner, of twelve inches in diameter, is to be fixed upon a horizontal shaft; that the bedstone, which is square, is to be grooved out to receive the runner, and that a small groove on the upper side of the bed stone is to admit the grain. The claim is "to the peculiar form and manner of constructing the mill stones, together with the general arrangement of the machinery."

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57. For machinery for *Spinning Hemp and Flax;* Andrew Caldwell, Lexington, Fayette county, Kentucky, August 20.

The patentee says that, "by the machine I have invented, and the improvements upon the spindle, (which requires one hand to each spindle,) I am enabled to spin twice as much yarn as is now spun by one hand in the

ordinary mode, besides having brought the operation of spinning into the compass of a room, and adapted it to a new source of labour, old and young, male and female." He does not, however, make any distinct claim, but leaves it to be inferred, from the general description, in what his invention consists. A number of figures are given in the drawings, and we cannot afford the space which without these would be required to describe the article.

58. For an improvement in the *Double Acting Forcing Pump;* William Douglass, Middletown, Middlesex county, Connecticut, August 20.

It is here stated that the valves in the common double acting forcing pump are usually covered, and hinged with leather, and that the improvement which the patentee has made in this part, consists in the employment of puppet valves, of metal, which, he says, are well known, but not hitherto employed in such pumps. The cap, and bottom, which cover and sustain the main cylinder, and the suction and discharge cylinders, are to be so cast as to adapt them to the use of such valves. The claims made are, "*First.* The application of the aforesaid metallic *toad stool valves*, in the heads of my pump, in lieu of said leather valves, or any other kind of valves now in use in double acting forcing pumps. *Second.* The construction of the end pieces, or heads, of said pump, so as to cover at once the ends of the several cylinders, and so as to admit the insertion of metallic, or any other kind of valves, in said end pieces, or heads, instead of having them placed in the pipes."

Such valves have been used in double forcing pumps, as well as in others and we do not believe, therefore, that the claim of the patentee can be sustained; and if it can, he would certainly be confined to the particular arrangement which he has adopted.

59. For *Slabs for Fire Backs, Stove Linings, &c.;* Joseph Putman, Salem, Essex county, Massachusetts, August 20.

All that we learn from this specification is, that moulds are to be made to receive the clay, which moulds must be in the form necessary to give to it the intended shape; that the clay is to be beaten in by a mallet, and the superfluous portion removed.

60. For *Constructing Granaries;* John Harmony, Chambersburg, Franklin county, Pennsylvania, August 20.

The thing here patented is very simple, and, if effectual, is of great value. The "improvement consists in introducing a hog or sheep pen, either under or very close to a suitable room, or apartment, into which the grain is to be put, having found, by repeated experiment, that the effluvia of the pen, or some such cause, operates as a complete preventative against the attacks of the weevil, and also that, should the grain be infected by them, they will speedily leave it." After this information, the patentee describes what he esteems a good plan for the erection of such an establishment; but the particular mode is not considered as important, the claim being simply to "the combination of a hog pen, or sheep pen, with a granary, as set forth."

61. For an improvement in the *Harrow and Cultivator;* Peter Clark, Aurora, Erie county, New York, August 20.

This cultivator is so constructed that its two sides, which form a V, as

usual, may be expanded, or contracted; there is also some variation in the manner of forming the teeth, but the change in this part does not appear to be very definite, or important. The claim is to "the peculiar formation of the tooth, without a flanch; the mode of fastening it, and giving it a forward direction suited to the graduated width of the harrow, and to the method of graduating the same."

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62. For an improvement in *Steam Boilers, and the method of feeding them;* Nathan Reed, Belfast, Waldo county, Maine, August 20.

The construction of this boiler, with its appendages, is very clearly described, and well represented in a good outline drawing; the things claimed, also, are distinctly set forth, leaving nothing to desire on this point.

The boiler is to be cylindrical, and is to contain within it a furnace, and a flue passing through it, in the manner of many others. The boiler is not to be placed horizontally, but is to be elevated at its back end; as shown in the drawing, this elevation is equal to one-half of its diameter. From the back end of the boiler there rises a vertical cylinder, which is to be the reservoir for steam, it being intended to keep the boiler entirely full of water, and to allow it to rise to a certain height also in the reservoir. The reservoir contains a float, which is to be sustained by the water, and from this float rises a vertical rod, passing through a stuffing box at the top of the reservoir. The apparatus by which the feeding of the boiler is to be regulated, is governed by a lever, acted upon by the rising and falling of the float rod; but the particular arrangement of the parts intended for that purpose, would require the drawing for its explanation. One peculiarity of this arrangement is, that the feeding of the boiler is to proceed when the motion of the engine is stopped; in this case, if the water is sufficiently low, a tube is opened, by the turning of a stop-cock, which admits a portion of steam from the reservoir into a case containing a small rotary engine, or steam wheel, constructed like an ordinary water wheel, which is blown round, and works the supply pump of the engine; when requisite, a portion of the steam blows off through another tube, opened at the same time with the former, as, otherwise, the velocity of the feeding engine might be too great.

The claims made are to the construction of the boiler, so that every part exposed to the action of the fire shall be kept constantly full of water, whilst the steam generated shall ascend freely into the reservoir, where it is isolated from the direct influence of the fire by a stratum of water. The manner of fixing and connecting the float, so as to ensure a more frequent action of the feeding apparatus. The method of giving vent to the accumulated steam, by the same operation which shuts off that from the engine; and the method of diminishing the velocity of the feeding engine, by the additional waste pipe.

Were it not the case that floats, rods sliding in stuffing boxes, supply pumps, and other apparatus usually combined and connected in self-regulating and self-feeding contrivances, added to steam engines and their boilers, are each liable to derangement from causes which cannot be rendered self-regulating, we should expect much from the apparatus described, which is ingeniously imagined, and looks well upon paper; but we are admonished, by some knowledge of practical results, not to trust implicitly to fair promises, and specious appearances, especially where complicated machinery, and powers of difficult management and control, are concerned.

63. For a *Brick Press;* Henry Hunsicker, and Joel Krauss, Northampton, Lehigh county, Pennsylvania, August 20.

This brick press possesses considerable originality, and is sufficiently well described. It contains two moulds, which are operated upon by the same lever, the moulds being upon a sort of railway, upon which they pass alternately under the lever. The moulds are of cast-iron, and their bottoms constitute movable pistons, which rise and deliver the brick at the top by the same movement which carries the moulds under the pressing lever. Each mould has its own follower, which rises, and closes on it, by the general shifting motion, all which is distinctly shown in the drawing. Theclaims made refer to the particular construction of the respective parts, for producing the action required.

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64. For a *Washing Machine;* David Winthrop, Kennebec county, Maine, August 27.

Stocks, or beaters, are to be worked backward and forward in a trough, as in many other washing machines, the trifling change made in this we will not wait to describe, but merely give the claims, which are to "the application of the gear work to the stocks; and to the putting them directly through the arms of the stocks."

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65. For a *Washing Machine;* William and John Collins, Norwich, New London county, Connecticut, August 27.

This machine is so much like that patented by Charles Otis, on the 15ht of June last (see p. 62) that we need not repeat the description.

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66. For the *Application of Hydraulic Cement to various purposes;* Obediah Parker, city of New York; Timothy Clowes, Hempsted, New York, and Lyman Garfield, Troy, New York, August 27.

American hydraulic cement is to be employed to form *lithotaphs*, for the bodies of the dead. An oblong mould of boards is to be made which may be seven feet long, and three feet wide; this is to be placed upon the ground, and a layer of about four inches of hydraulic cement put within it. The corpse, either in a coffin, or some suitable envelope, is to be laid upon this, and the mould, which should be about two feet six inches high, filled with the cement, the mould being then removed, the *lithotaph* is finished.

Rows of these may be placed close to each other, and upon them may be deposited other *lithotaphs*, so as to form a *necropolis.*

This forming of *lithotaphs*, and a necropolis, is claimed by the patentees; and also the forming of lithotaphs in ordinary vaults, or repositories of the dead. They also claim the giving to them different forms, with inscriptions, &c.

We have so often given our opinion respecting this kind of application of what is well known, in a way obvious to every one, that we shall not repeat it here. We are, in this instance, at no little loss how to assign to each of these patentees a share in inventing a thing which has no, or very little, invention in it, yet each must have contributed his quota, and we take it for granted that each can point to his own share. (See Dayton, Hoyt, and White's patent, p. 39, and White's, No. 35, for July.)

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67. For *Ranges for Cooking, &c.;* Thomas B. Smith, city of New York, August 27.

A series of cast-iron boxes, lined in part with fine brick, is placed within a table, or dresser, for cooking, &c; each of them is to have a grate to sustain the coals, and an ash-pan or drawer, below it; provision is made for varying the height of the grates, by placing them upon different ledges, and there is to be a flue to carry off the heated air, &c."

Claim.—"What I claim as my own invention in the foregoing range, is the combination of the whole; and its application to use in the manner described."

In a contrivance so old as ranges of such boxes for stewing, boiling, &c., &c., so very like those described, it is to be wished that the patentee had been less general in his claim, and that he had distinguished his invention "from all other things before known or used."

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68. For *Arresting the Sparks from Locomotive Engines;* Alfred C. Jones, Portsmouth, Norfolk county, Virginia, August 27. (See description at p. 100.)

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69. For improvements in the *process and Apparatus for Distilling Spirits of Turpentine;* Isaiah Jennings, city of New York, August 27. (See Specification.)

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70. For an *improvement in the art of manufacturing Neck Stocks;* Thomas Goodrum, city of New York, August 27.

"The principle of this improvement consists in the manufacture of neck stocks with strips or pieces of whalebone, of any convenient size and shape, instead of bristles or hair."

The whalebone is to be split into fine shreds, and interwoven in the foundation for stocks, as hair is interwoven. The patentee tells us that "the advantage of this material, over other materials, consists in its cheapness, and in its preserving, in a superior degree, its elasticity, in not being liable to be broken down, and in its uniformity of size, being of the same size throughout, whereas bristles and hair are tapering, and larger at one end than at the other."

The validity of the patent does not depend upon the validity of each of the reasons assigned for its superiority, or we should really doubt its being sustainable.

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71. For an improvement in the *Gearing of Mills;* Cleaverious R. Coleman, Barry's Bridge, Lunenberg county, Virginia, August 27.

A complex arrangement of wheels is here described, which presents nothing new in principle, or advantageous in practice, although the patentee proposes its application to mills of nearly all kinds. Thirteen cog wheels are represented in the drawings as employed to get up the intended motion. There are two wheels, or rims, with teeth on their interior, pointing towards the centre: these are fixed to a frame, one above the other, the main shaft, with four cog wheels on it, revolving vertically within them; two of these cog wheels mash into two others, which in their turn mash into the rims, within which they travel round.

We do not think it necessary to trace the movement any further, but will add the fashionable claim of the arrangement and adaptation of the several parts of the before described machinery for the gearing of water, wind, horse, hand, steam, saw, cotton, thrashing, and fanning mills."

72. For a *Thrashing Machine, for Rice and other grain;* William Matthews, Charleston, South Carolina, August 27.

Most of the parts of this thrashing machine are so similar to many others before used, that it would be time lost to describe them: in making out his claim, the patentee seems to be at some loss to divide the new from the old, as will appear from the following.

"What I claim as my invention is, *first*, the plan of setting the forward feeding table roller nearer to or further from the feeding rollers. *Second.* The application of the cog wheel gearing, according to the plan and proportions set forth, for driving the feeding rollers. *Third.* The application of a beating cylinder, either with stationary bars, and square, or rather oblong teeth, (or with the hinge beaters, though I do not claim the invention thereof) to a concave bed as described above; though I do not claim said form of bed as my invention. *Fourth.* The application of the comb, driven as above set forth, and over the bed above described; though I do not claim the invention of said combs or bed."

The foregoing may serve well to exemplify the absurdity of the claim so frequently made to the *application* of what belongs either to an individual, or to the public. It is the application of what a patentee himself invents, that gives to his patent its whole value.

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73. For a *Thrashing Machine;* John Gearhart, Rush township, Northumberland county, Pennsylvania, August 27.

"What I claim as my invention, or improvement, in the machine for thrashing grain and seed, is the mode of constructing the concave beds and cylinders as above set forth. The concave bed differs from those of other thrashing machines by being *whole*, instead of being segments, and of course is more solid and true, and can be put in, or taken out of, the frame, with much greater facility. The cylinder differs from those of other thrashing machines by being *whole*, instead of being in *segments*, and of course is more solid and true."

If the patentee had seen one half of the thrashing machines which have been devised and made, the above supposed difference would have vanished from his imagination.

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74. For a *Plough;* William Holt, Buffalo, Erie county, New York, August 27.

The mould board, share, and coulter, of the cast-iron plough, are, according to his statement, improved by the patentee; but if they are so, he has failed in pointing out his improvements with sufficient clearness. We are told that the handles and beam are to be of wood, but that the mould board must be of cast-iron, as also must the land side and the share; the latter is to have a square point for the purpose of entering the lower part of the coulter. Several other equally important matters, of a like nature, are stated, to which is added that the plough is to be "used by applying horse power to the end of the beam, and is guided by a person having hold of the handles." The specification closes with the information that his plough will perform its work in a very superior manner."

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75. For *Fire Engines;* Thomas Odiorn, Portsmouth, Rockingham county, New Hampshire, August 27.

In this fire engine the box that is to contain the water is covered with a circular platform upon which the persons who work it are to walk; the engine being worked exactly in the manner of a ship's capstan. The head into which the levers are inserted revolves upon a hollow shaft through which the tube ascends that leads to the crane neck. There are teeth on the lower edge of this head, forming it into a crown-wheel, and these take into four pinions, having cranks on them, which work the pistons of four pumps, forcing the water into a central air vessel. The claims made embrace the particular mode of constructing and working fire engines, as above described.

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76. For a *Pump applicable to Ships and other purposes;* Thomas Odiorn, Portsmouth, Rockingham county, New Hampshire, August 27.

There are to be two pumps, placed near to each other, and above these is a shaft placed horizontally, with a winch at each end, by which it is made to revolve. The pumps used are the "triangular valve pumps" invented and patented by Jacob Perkins, and described and represented in Rees' Cyclopedia. A strap, or chain, is attached to the rising valve of each of these pumps, and raises it by winding round a drum on the horizontal shaft; these drums are alternately thrown in and out of gear, so that whilst the bucket of one pump is being raised, the other descends by its gravity, and in this way a constant stream is obtained from one or the other of the pumps. The claims made are to the particular form and arrangement of the respective parts, described and figured, by which the drums are thrown in and out of gear, and the pumps alternately worked.

The description and plate of Mr. Perkin's pump will be found under the article *Pneumatics*, in Rees, and the mode of working it there shown will be found incomparably superior to that now patented, the power being more readily and advantageously applied.

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77. For a *Grater;* Ebenezer B. Story, Buffalo, Erie county, New York, August 27.

This grater consists of a sheet of tin perforated with holes, and placed in a box in a sloping direction, so as to make an angle of fourteen degrees with the horizon. "The length of the box on the top is to be two feet one and one fourth inch. The length of the bottom of said box is one foot eight and one fourth inch; the width ten inches, the height thereof nine inches. The size of the grater may be varied to suit the wishes of the person for whose use it is made. I claim therefore the invention of such grater, and such improvements as herein set forth and described."

A more trifling patent than this does not often find its way to the office.

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78. For *Roller Grooving Planes*; James Herman, Lancaster, Fairfield county, Ohio, August 27.

This improvement consists in placing metallic rollers on the face, and on the fences of the planes to lessen the friction; an additional bit is also to be added to each plane, for the purpose of champhering the corners of the tongue and groove. We are not sure that the rollers will be deemed an improvement by workmen generally, a certain adhesion of the plane to the stuff being generally thought advantageous. Much care also will be required, or the gudgeons of the rollers will soon wear out. Would not steel facings be better?

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—There are no occultations of stars of the sixth magnitude, and upwards, visible at Philadelphia in the month of April.

S. C. WALKER.

Meteorological Observations for December, 1835.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer Sun rise.	Barometer 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
☉	1	24°	35°	29.90	29.90	W.	Moderate.		Clear—lightly cloudy.
	2	21	23	30.10	30.20	NW.	Blustering		Clear day.
	3	12	27	.40	.26	W.	Calm.		Clear—lightly cloudy.
	4	24	40	.00	29.76	SW.	Moderate.		Clear—cloudy.
	5	31	33	29.60	.60	W.	Blustering		Clear—flying clouds.
	6	20	32	.54	.54	NW.	Moderate.		Lightly cloudy.
	7	20	30	.80	.85	W.	Brisk.		Clear—lightly cloudy.
	8	21	28	.94	30.00	W.	do.		Cloudy—clear.
	9	21	40	30.00	.00	SW.	Moderate.		Clear—lightly cloudy.
	10	30	31	29.95	.00	W.	Blustering		Clear day.
	11	15	33	30.00	.00	W.	Moderate.		Clear—lightly cloudy—snow in n't
	12	31	34	29.94	.30	N.	Brisk.		Rainy day.
☾	13	32	32	.80	29.80	W.	Moderate.	1.05	Clear day.
	14	42	43	.60	.77	SW.	Brisk.		Lightly cloudy.
	15	19	36	.84	.53	SW.	Moderate.		Clear—lightly cloudy.
	16	8	13	.85	.65	W.	Blustering		Clear day.
	17	5	11	30.24	30.25	W.	Moderate.		Clear—lightly cloudy.
	18	15	25	.20	.20	SE.	do.		Lightly cloudy—sleet.
	19	26	26	.06	.13	E.	Calm.	.37	Sleet—cloudy.
⊗	20	32	34	.10	.05	SE.	do.		Thaw—foggy.
	21	34	41	29.90	29.90	W.	do.		Rain—cloudy.
	22	32	33	.98	.90	W.	do.	.13	Cloudy—clear.
	23	17	25	30.15	30.25	W.	Moderate.		Clear day.
	24	17	30	.50	.30	SW.	do.		Clear—lightly cloudy.
	25	35	45	29.90	29.90	SW.	Calm.		Cloudy—lightly cloudy.
☽	26	44	47	.45	.45	S.	do.	1.25	Rain—cloudy.
	27	36	35	.60	.60	NW.	Blustering.		Flying clouds.
	28	32	39	.65	.65	NW.	Moderate.		Clear—flying clouds.
	29	26	41	.95	.85	SW.	do.		Lightly cloudy.
	30	42	42	.75	.70	NNE.	do.		Clear—lightly cloudy.
	31	32	32	.60	.60	NW.	do.		Cloudy—clear.
Mean		24.74	32.77	29.87	29.90	NW.	do.	2.80	

Thermometer.			Barometer.
Maximum height during the month,		47. on 26th.	30.40 on 3d.
Minimum	do.	5. on 17th.	29.45 on 26th.
Mean	do.	28.75	29.88

NOTE.—The specifications of American patents, and several original articles, intended for this number, have been forced out, and are unavoidably postponed to the next month.